Unawareness of Paralysis Following Stroke: An Existential-Phenomenological Inquiry into the Paradox of Anosognosia

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Statement of authorship

This dissertation is written by Aikaterini Fotopoulou and has ethical clearance from the New School of Psychotherapy and Counselling and the Joint South London and Maudsley and the Institute of Psychiatry NHS Research Ethics Committee. It is submitted in partial fulfilment of the requirements of the New School of Psychotherapy and Counselling and the Psychology Department of Middlesex University for the Degree of Doctor of Existential Counselling Psychology and Psychotherapy. The author reports no conflicts of interest, and is alone responsible for the writing of the dissertation. *No part of this thesis has been submitted by the author towards any other educational degrees in the UK or elsewhere*.

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Abstract

We inescapably experience the world through our body. Yet as our embodiment itself is the background of all our everyday experience, it appears to be experienced quietly. We tend to take for granted that our body is present in and contributing to all experience, as we also tend to take for granted the feeling that it belongs to us and it is under our control. However, certain neuropsychological disorders that arise after damage to the right hemisphere of the brain serve as a reminder that these feelings and intuitions cannot always be taken for granted. What is more '*counter*-intuitive' than someone who is unaware of the fact that they can no longer move half their body? Or someone who cannot recognise their own arm or, leg as theirs? These disorders have troubled neurology, philosophy and psychology since the time of Charcot, Janet, Freud and Babinski and continue to represent frequent, largely unmet and poorly studied clinical challenges. The present thesis aims to explore from an interdisciplinary vantage point the way in which the body is experienced in people with such neuropsychological disorders following a stroke. More specifically, it aims to complement current scientific perspectives on these disorders with existential-phenomenological ideas regarding the experience of embodiment in these patients, with particular emphasis on the 'pre-reflected' dimensions of embodiment and their derivatives in mental life as highlighted by the philosopher Merleau-Ponty.

The empirical part of the thesis involves behavioural and neuroimaging methodologies from the field of neuropsychology, including two case series and one single case study (total N = 14). Three hypotheses inspired by the early writings of Merleau-Ponty on embodiment were explored in these three studies, respectively: (a) whether patients with motor unawareness have a 'pre-reflective' awareness of their deficits; (b) whether such forms of pre-reflective awareness may paradoxically contribute to their explicit unawareness and (c) whether insights generated by the above two studies could be translated to a psychophysical intervention that can help a patient recover her explicit awareness of her paralysis. The results of these studies

confirmed all three hypotheses, with some theoretical constraints that are discussed in each chapter.

More generally, the results of these studies are discussed in relation to both scientific and philosophical theories of body awareness and most importantly in relation to clinical challenges and the scope of existential counselling psychology. I argue that these disorders allow a unique insight into how existential, counselling and psychotherapeutic psychology can position its practice in relation to some of these paradoxical ways of being-in-the-world that are not habitually so 'visible', unless revealed by brain damage. These considerations apply particularly to the more general paradox of psychotherapeutic clients who frequently come to therapy consciously hoping to change their habitual ways of being-in-the-world while implicitly, yet with almost equal force, they may hope not to change their commitment to the world.

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1. Chapter 1 Introduction and Literature Review

1.1. An Introductory Overview of the Thesis

Acquired brain damage[1], as may be caused by a stroke, can lead to contralateral hemiplegia (i.e. paralysis of the side of the body opposite to the side of the brain damage). This may sometimes be accompanied by feelings and beliefs about one's body that are not shared by the people in the patients' social environment, nor the clinical team responsible for their care. Patients may, for instance, falsely believe that they can move their paralysed limbs despite being demonstrably unable to do. They may even attempt to move and injure themselves in the process. Other patients may deny the ownership of their own arm or leg and claim that it belongs to a spouse, or friend, despite acknowledging that it is attached to their own body. Such neuropsychological disorders that entail counterintuitive and relatively long-lasting abnormalities in the subjective experience of one's own body[2] have long captured the interest of not only neurologists and neuroscientists but also philosophers and psychologists (see Literature Review below for details). These disorders will also be the focus of the present thesis.

Specifically, these disorders raise questions regarding the bodily foundations of our self-consciousness. While this thesis will not undertake a detailed review of the literature dedicated to clarify the notion of the self, it follows certain psychologists, philosophers and neuroscientists who do not conceive the self as a static internal snapshot of some mysterious substance, or structure called "the self" (Varela, Thompson & Rosch, 1991; see Appendix VI for a heuristic glossary of terms). Rather they have grounded the notion of the self in its *embodied foundations* (Bermúdez, Marcel & Eilan 1995; Gallagher, 2005; Legrand, 2006) and

[1] This excludes spinal cord injury that does not affect the brain per se and hence it is not typically associated with such cognitive deficits

[2] Several debates surround the terms 'experience' and 'perception', as well as 'awareness' and 'consciousness' in philosophy that exceed the scope of this thesis (see Glossary for heuristic definitions).

have opted for employing a variety of first- and third-person approaches to the description of a "core" or "minimal" self, as the common denominator of all other facets of self-consciousness (Gallagher, 2000; see also Glossary). This minimal self is conceived as an ongoing, emergent process of tracking and controlling bodily properties as a whole. Embodiment refers to the fact that the experiences I am living through are given to me through my body, an organism situated in a particular space-time context. Indeed, the idea that our everyday experiences are characterized by a minimal or 'pre-reflective' (see below) sense of self has been highlighted by a longstanding phenomenological tradition and more recently referred to as the "minimal self" by contemporary philosophers such as Zahavi (2005, 2014), Gallagher (2008) and Legrand (2006) with direct reference to the phenomenological tradition. According to such views, the development of the mind, and particularly cognition, can be viewed as the consequence of embodiment within a wider physical and social environment.

Motivated predominately by such contemporary, phenomenological views on 'embodied cognition' and the minimal self, that are seen as attempts to further develop Merleau-Ponty's unique perspective on the role of embodiment for the structuring of all experience (see Literature Review), the present thesis aims to explore from an interdisciplinary vantage point the way in which the body is experienced in people with 'unawareness of paralysis' following a stroke. More specifically, it aims to provide an alternative to the one-to-one aetiological relations between neurological deficits and unawareness put forward by current neuroscientific models and complement scientific perspectives with existential-phenomenological ideas regarding the experience of embodiment in these patients, with particular emphasis on the pre-reflected dimensions of embodiment and their derivatives in mental life. Three hypotheses inspired by existential-phenomenological views on embodiment are explored in the present thesis: (a) whether patients with motor unawareness have a 'pre-reflective, or tacit' (see below for definition of this term in both philosophy and science) awareness of their deficits; (b) whether such forms of prereflective awareness may paradoxically contribute to their explicit unawareness and (c) whether insights generated by the above two studies could be translated to a psychophysical intervention that can help a patient recover her explicit awareness of her paralysis. The results of these studies will be first discussed in relation to both scientific and philosophical theories of self-consciousness but ultimately they will be considered in relation to clinical challenges and the scope of existential counselling psychology. It is hoped that the results of such enquiries will contribute to a better

theoretical and clinical understanding of body unawareness from both a neuropsychological and a phenomenological-existential perspective, by generating new insights to existential theory, as well as to existential counselling and psychotherapeutic psychology.

Methodologically, the thesis attempts to follow Merleau-Ponty's[3] epistemological stance in exploring theoretically and empirically the phenomenon of neurological motor unawareness from an interdisciplinary perspective (see Chapter 2 for further details and justification). Merleau-Ponty (1945/1962) argued that one way by which philosophical enquiry can discover the modes of pre-reflective experience is by examining breakdowns in bodily functions, and particularly brain functions. He argued that we can thus discover the underlying patterns of our normal conscious state that hide their influence; that work at leaving no traces of their 'crime'. For Merleau-Ponty, the experience of the body cannot be reducible to the consciousness of the body; the role of the body in mental life is to a degree 'prereflective' and as such impenetrable to phenomenological reflection, it must be worked out conceptually in relation to the empirical sciences. Thus, Merleau-Ponty himself indeed examined breakdowns in brain functions, to discover the hidden modes of our pre-reflective experience of the body and the world more generally. In recent years, this epistemological and methodological stance has been revived by certain proponents of the embodied and enactive cognition approach (e.g. Varela, Thompson & Rosch, 1991), who have criticised the phenomenological tradition of remaining abstract and dedicated to exploration by reflection only, despite the emphasis of many scholars on praxis and action. They have suggested that interdisciplinary efforts, including ones that include scientific experimentation, may represent necessary, more embodied and active engagements with human nature and particularly the paradoxes of self-consciousness (Varela, Thompson & Rosch, 1991). The present thesis will follow a similar epistemological path (see Chapter 2 for details and justification). Specifically, the thesis will make use of quantitative, experimental research methods from neuropsychology to investigate the nature of body awareness following a stroke, while at the same time it uses insights from phenomenological-existential theories to generate novel hypotheses and insights about the embodied experience of such patients. This methodological approach is not free of tensions and limitations, and is unlikely to be sufficient to fully engage with the lived experience of these patients in ways that perhaps qualitative methods may have. Nevertheless, as I argue in

[3] Particularly Merleau-Ponty's early works, such as the now classic work 'The Phenomenology of Perception' (1945/1962) and other early writings (e.g. 'The World of Perception', 1948/2004).

detail below (see Chapter 2), it may be a necessary first step towards an integrative, interdisciplinary consideration of such phenomena given (1) the practical restrictions imposed by the nature of associated cognitive deficits at acute and subacute stages of post-stroke recovery, as well as (2) the epistemological and professional gulf between scholars of the mind and brain that has been created over the decades in relation to such disorders, i.e. disorders that lie at the crossroads between the psychological and the neurological, the biological and the mental (see below and Chapter 2 for details) and lastly (3) the intertwined relation between our embodiment and our consciousness that at times leads to some paradoxical ways of being-in-the-world that are not habitually 'visible', unless revealed by brain damage and ensuing psychological changes (see Chapters 2 and 4 for details).

In addition to the theoretical and epistemological importance of examining the experience of the body following neurological damage, such a topic is of clinical relevanceparticularly to psychotherapeutic and counselling psychology. The handful of attempts to provide psychotherapy to these patients has shown that these symptoms are not only linked with very powerful emotions, but also that the establishment of a good therapeutic rapport reveals a number of psychological struggles with a new personal and social reality (e.g. Kaplan-Solms and Solms, 2000). Moreover, even if the phenomena in question are transient and thus of limited interest to neurologists and neuropsychiatrists, their occurrence at this critical stage is a major obstacle in acute settings, as it can have long term effects on patients' psychological and physical recovery (Gialanella et al., 2005; Prigatano, 2010; see Literature Review for further details). Unfortunately, patients may fail to see why they need to engage with the clinical team in addressing a problem they do not believe they have and often invitations of cooperation are ineffective. I thus believe that an interdisciplinary inquiry into the embodied experience of these patients as seen in a general in-patient stroke ward may uniquely contribute to the wider understanding that patients' needs for psychotherapy may be added to their needs for speech therapy, occupational therapy and physiotherapy that are routinely offered in such wards, hopefully with important clinical implications.

Unfortunately, there is currently no specialised provision for the psychological treatment or management of body unawareness and related disorders in most Western countries. The provision of counselling and psychotherapy constitutes an exception and most research on the topic has not hitherto been clinically pertinent (Kortte & Hillis, 2011; see Prigatano & Morrone-Strupinsky, 2010 and Jenkinson, Preston & Ellis, 2011, for reviews). Specifically,

stroke-related symptoms of body awareness are often considered as 'unintentional' by neurologists, as the direct consequence of brain damage, occurring somehow 'irrespective of' the subject and his feelings (e.g. Bisiach and Geminiani, 1991). Sometimes clinicians claim that patients' experience 'is not real', or that the denial of their deficits is not 'psychological' denial, but 'genuine' neurological unawareness (e.g. Prigatano, 2014). Such rather dualistic perspectives have rendered the need for psychotherapy somehow obsolete in 'genuinely anosognosic' patients, who are implicitly conceived as broken down machines rather than individuals with goals and motivations. Indeed, it seems that one of the reasons for this health care neglect may be the association of brain damage with old-fashioned medical traditions in neurology, which view psychological factors and changes as unrelated, or at best secondary to brain function. In addition, within clinical psychology, psychometric traditions are concerned with identifying the critical 'cognitive' deficits following brain damage without a necessary parallel concern for understanding the emotional state and subjective experience of the patient, or their potential relation to the patient's more general embodiment.

Indeed, in a review of a different yet similar topic of false memory following neurological damage, I have argued that research and clinical practice in the field of neuropsychology have been dominated by implicit dualism and polarisation between neurological and cognitive views on the one hand and psychotherapeutic and particularly psychodynamic views on the other (Fotopoulou, 2008). It seems that something similar has taken place in the study and clinical treatment of body unawareness, with no communication or cross-fertilisation between neurological and cognitive views on the one hand and philosophical, or psychotherapeutic views on embodied cognition on the other. As I outline in my personal statement below (see Chapter 2), I believe that such polarisation can only harm the patients themselves and their families whose experience following a stroke is literally 'divided' between professionals. This thesis is predominately motivated by the willingness to take the risk of considering such phenomena across the fields, even if this entails a necessary methodological reductionism (see glossary) and a number of areas of theoretical and professional tension between different scholarly traditions, as I outline in Chapter 2 below.

Before reviewing the background of this project more formally however, I wish to emphasise that this professional division is not of course limited to body awareness deficits

following stroke. The first half of the 20th century brought about a wide divide between mind scholars in the sciences and the humanities, with deep divisions between biologists, geneticists and brain scientists on the one side and clinicians, philosophers and social scientists on the other. By contrast, in the last 50 years one has seen the gradual emergence of many interdisciplinary traditions attempting to reduce this divide, including neuropsychiatry, neuropsychology and even neurophilosophy and neuropsychotherapy. Such fields have allowed some cross-fertilisation in areas of neurological interest, such as the consideration of the relationship between neurological false memories and the philosophical concept of self-deception (Hirstein, 2005), as well as various other philosophical perspectives on psychopathology as seen in either psychiatric or neurological contexts (e.g. Bayne & Pacherie, 2005; Price, Barrell & Rainville, 2002 Eilan, 2000; see also Chapter 2 for detailed description). Nevertheless, it appears that implicitly dualistic perspectives on the mind exist and such interdisciplinary endeavours are frequently criticised as betraying the principles and epistemological constraints of each discipline (e.g. Fotopoulou, 2012; see Chapter 2 for details).

A characteristic example of the consequences of such dualism and the resulting alienation between fields is the neuropsychiatric *counterpart* of the unawareness phenomena that will be considered in this thesis. Specifically, while some stroke survivors may become unaware of their paralysis, some individuals without any known history of neurological damage may experience paralysis, or other sensorimotor symptoms such as tremor, epileptic-type attacks, or sensory disturbances. In this sense, 'functional' sensorimotor symptoms are the 'inverse' of anosognosic symptoms. Some patients may be affected by such symptoms for years, but clinical assessment shows that normal function is possible in the relevant body parts. For example, in some patients with left leg weakness, power of hip extension may be weak when tested directly, but the apparently weak muscles may activate normally when the patient activates the right hip flexor (Hoover's sign; Hoover, 1908). Unfortunately, such 'signs' are not available in many other cases. Historically, and mainly under the influence of psychoanalytic theory, psychological, emotional factors, such as trauma, sexual conflict or distress, have been suggested as causal factors. These explanations are reflected in the various alternative terms used to describe these disorders, such as psychogenic, psychosomatic, conversion, or hysteria. Distress and psychological trauma are indeed seen at higher rates in these patients than in the healthy population (Hallett, Fahn & Jankovic, 2006), but they have not been found to be sensitive markers of functional neurological symptoms (Roelofs &

Spinhoven, 2007). Thus, an alternative, perhaps equally problematic terminology focuses on what patients do not have (non-organic, medically unexplained symptoms). Indeed, the related debates regarding the 'psychogenic' or 'non-organic' causes of these disorders portray a compartmentalised, dualistic brain-mind relation.

Remarkably, this dualism has not only influenced debates regarding the aetiology of functional sensorimotor disorders but also views regarding their very existence, i.e. their occurrence and prevalence. Specifically, widespread beliefs among historians emerged in the last two decades according to which 'hysteria' as described classically by Janet, Freud or Charcot has all but disappeared in the 20th century (Shorter, 1992; Micale, 1994; Webster, 1996). In his book, *From Paralysis to Fatigue* (1992), for instance, Edward Shorter argues that symptoms like hysterical paralysis that were common in the 19th century are now rarities that have given way to more general presentations such as generalised fatigue. According to such historians, more classic hysterical presentations should instead be attributed to repressive Victorian culture, the poor 'psychological' literacy of the time and limited neurological understanding that misdiagnosed some 'genuine' neurological diseases for functional symptoms.

Yet, ample data demonstrate that both the quantity and the quality of functional symptoms remains unaltered in medical practice (Lempert, Dieterich, Huppert & Brandt, 1990; Parry, Murray, Hart & Bass, 2006; Perkin, 1989; Ewald, Rogne, Ewald & Fink, 1994; Stone et al., 2008), a situation that is curiously not reflected in research activity, historical accounts, teaching or public awareness. Indeed, more recently several neurologists and clinicians from various countries have started to write papers and reviews precisely to this effect, arguing that anyone with clinical experience in neurological wards knows that 'hysteria' has not disappeared (van Gijn, 2007; Stone et al., 2008). Instead, what seems to have disappeared in a willingness to clinically or scientifically consider phenomena that challenge any artificial divide between the mental and the bodily. In some neurologists' own words "we propose that when the neurological study of disease and the psychiatric study of neurosis became divergent endeavours at the start of the 20th century, hysteria fell into a no-man's land between these two specialities. Neurologists were not interested in seeing the patients and the patients were mostly not interested in seeing psychiatrists" (Stone et al., 2008; p. 12). In other terms, functional disorders seem to have fallen in the professional gap between interest in the psychological and interest in the neurological. Following several years of research and clinical placements in stroke wards (see also Chapter 2), I have come to realise that the phenomenon of post-stroke

motor unawareness shares such a fate with its counterpart; it has fallen into the professional gap between neurological indifference for the mental and a psychotherapeutic mistrust of the neurological. This thesis is motivated by the wish to take a first, tiny but firm step into this gap.

1.2. Literature Review

1.2.1. Embodiment and the 'Minimal Self'

The main topic addressed by this thesis relates to the 'embodied self'. The concept of the self, or self-consciousness has always been an elusive and controversial topic in the humanities and increasingly the sciences. Indeed, the question of what, if anything, makes the "self" a unifying phenomenon has attracted a considerable number of empirical studies and theoretical accounts. Philosophers like David Hume famously doubted its existence and one can find modern versions of such arguments in both philosophy (Metzinger, 2003; 2009) and science (Hood, 2012; Gillihan & Farah, 2005). Undertaking a detailed review of the literature dedicated to clarify the notion of self lies beyond the scope of this thesis. Rather, for the limited purposes here, it is important to notice that to face the challenge of an understanding of self-consciousness, including the problem of its existence and its definition, some psychologists, philosophers and neuroscientists have recently opted for distinguishing between several kinds and levels of self-consciousness and for employing a variety of first- and third-person approaches to the search of a "core" or "minimal" self, as the common denominator of all other facets of self-consciousness (Gallagher, 2000). Importantly, this minimal self is not to be conceived as a kind of internal representation of some substance called the "self". Instead, minimal selfhood is conceived as an ongoing, dynamic and emergent processes of tracking and controlling bodily properties as a whole and hence the notion of the self needs to be grounded in its *bodily foundations* (Bermúdez et al. 1995; Gallagher 2005; Legrand 2006)[4].

Such views have an intricate philosophical history and they have been recently invigorated in psychology and neuroscience; they stand in direct opposition to classic,

[4] It should be emphasied that the term 'self-consciousness' here, particularly as applied to the 'minimal self' does not imply a conscious of the 'self' as an object of consciousness, as something other than the 'act of consciousness' (see Glossary). It is instead conceived as the very 'givenness' of such experiences as mine, as I outline below.

Cartesian philosophical views on self-consciousness that portray a unitary and disembodied self. This Cartesian perspective has indeed been challenged by recent philosophical positions and scientific theories that view the self as primarily embodied and emergent. According to these approaches, (e.g. Bermúdez et al., 1995; Clark, 1998; Damasio, 1994; 1999; Gallagher, 2005; Gallese, 2007; Varela et al., 1991), several facets of cognition are causally or even constitutively related to the physical body and its potential for action. Moreover, whenever I perceive or feel something, these experiences are given to me as *mine*. Within the last few decades, a growing number of philosophical accounts described this feeling of "mineness" in terms of first-person giveness of experience that is subsumed under the notion of "minimal self" (Zahavi, 2005). A number of issues remain controversial within such approaches, such as the question of whether and to what extent mental representations are implicated in embodied cognition and the minimal self. In either case however, advocates of this approach agree on the following premise: if the self is that which perceives and acts and perceiving and acting are to be understood in bodily terms, then the self is, first and foremost, an embodied self.

Embodiment refers to the fact that the experiences I am living through are given to me through my body, an organism situated in a particular space-time context. Indeed, the idea that our everyday experiences are characterized by a minimal or 'pre-reflective' (see below) sense of self has been highlighted by a longstanding phenomenological tradition (E. Husserl, M. Merleau-Ponty) and more recently discussed by contemporary philosophers such as Zahavi (2005, 2014), Gallagher (2000, 2008) and Legrand (2006) with direct reference to the phenomenological tradition. This approach takes its roots on the idea that rather than viewing the body as a mere support system for a "mind that need to be fuelled and transported" (Pecher and Zwaan 2005:1), one needs to view the mind as a support system that facilitates the functioning and adaptation of the body within a wider physical and social environment. The development of the mind therefore, and cognition more specifically, can be viewed as the consequence of embodiment within such environment.

Prior to unpacking this notion from an interdisciplinary perspective, a few brief conceptual clarifications are in need. What is understood as 'pre-reflective awareness' within such context and particularly by contemporary phenomenological philosophers such as Zahavi (2005)? Philosophers usually start with the intuitive idea of reflecting upon our inner experiences: for example, I can introspect what I am experiencing right now while drinking my coffee. I can also recognise myself in reflective surfaces like mirrors and reflect that this image

is mine (see also Chapter 5). Hence, one convenient way to define the notion of *pre-reflective* self-awareness is by contrasting it with *reflective* self-awareness. The latter occurs for instance whenever one reflectively introspects one's ongoing experiences or during explicit self-recognition of one's face in the mirror. By contrast, pre-reflective self-awareness does not involve any form of high-order self-monitoring. One can get a bearing on this phenomenological take on self-awareness by contrasting it with the view on perceptual awareness defended by Brentano. According to Brentano (1874/1973), when I perceive a glass, I am aware that *I* am perceiving a glass. Importantly, he acknowledges that I do not have here two distinct mental states, but rather one single mental phenomenon: my awareness of the glass is one and the same as my awareness of perceiving it. But by means of this unified mental state, I have an awareness of two *objects*: the glass and *my* perceptual experience. Opposing this view, classic phenomenologists such as E. Husserl, existential phenomenologists such as J-P. Sartre and contemporary philosophers[5] (Legrand, 2006; Zahavi, 2014) insisted upon the idea that my awareness of *my experience* is not an awareness of it as an object, in the sense that I cannot endorse the perspective of an external observer or spectator on it. In pre-reflective self-awareness, experience is given not as an object, but as a fundamentally *first-personal* subjective experience.

Indeed, some contemporary phenomenological accounts suggest that in pre-reflective self-awareness, experience is a fundamentally *first-personal* subjective experience (Zahavi, 2005); it possesses 'egological' content, or content that concerns oneself. Thus, whenever I perceive a painting, the perception of the painting is somehow given to me as *mine*, in that I have simultaneously a tacit experience of myself as the subject of that perception. While not all philosophers would agree with this suggestion (e.g. Janzen, 2007), for some philosophers (Zahavi, 2005 and some neuroscientists (Damasio, 1999), this egological content is synonymous with the feeling qualities that are intrinsic to phenomenal consciousness, the 'what-it-is-like' qualities of subjectivity. Put crudely, one cannot look at the painting without being tacitly, necessarily aware that the feelings and sensations one may have about the painting, are *one's own* feelings and sensations. Clearly, there is much more to be said about perceptual awareness in general and the related debates in contemporary philosophy but for the purposes of this thesis, I will restrict my focus to the phenomenological insight according to which our experiences always involve a kind of implicit, pre-reflective self-awareness which

[5] For a detailed discussion of these points see the volume *Pre-reflective Self-Consciousness: Sartre and Contemporary Philosophy of Mind* edited by Miguens et al. (2015).

is a more *basic* form of self-awareness and other more high-order, reflexive forms of awareness are built upon it.

Crucially, the bodily self is not an awareness of the body in passive isolation from the physical and social world. It is the awareness of an active body dynamically exploring the environment. Indeed, both classic phenomenologists such as E. Husserl and M. Merleau-Ponty (see below) and more recently researchers working within the embodied/enactive cognition paradigm (e.g. Varela et al. 1991; Gallagher, 2005) insist on the idea that pre-reflective self-awareness ought to be understood primarily by taking into account the larger brain-body-environment dynamics (De Jaegher & Di Paolo 2007; Menary 2007; Hutto and Myin 2013, Colombetti 2014). This emphasis on embodied cognition was recently adopted also in science and hence I now turn to some of these considerations in science, with particular reference to the present thesis.

1.2.2. Parallel Empirical and Theoretical Considerations in Science

The above philosophical perspectives on embodiment are endorsed by many contemporary scientists (of course to different degrees and not always in full correspondence with the philosophical traditions from which they originate) and hence embodied cognition has been the focus of much empirical research in the past two decades. In relation to the present thesis, a plethora of investigations in experimental psychology and cognitive neuroscience have used several experimental 'tricks' to systematically manipulate sensorimotor signals, promote their integration, or generate conflicts and illusions, and hence study their role in body awareness (Blanke et al., 2015 for review). These studies, as well as investigations in neuropsychology and neuropsychiatry (see Jenkinson & Fotopoulou, 2014 for review) suggest that primary sensorimotor signals, including both interoceptive (signals originating from within the organism, such as proprioception or cardiac variables) and exteroceptive (sensory channels linked to classic sensory systems such as vision and audition) signals about the body, are integrated and organised at different levels of the neurocognitive hierarchy to form several neurocognitively distinct dimensions of minimal, as well as 'extended' selfhood. Related notions, for example, are the concepts of 'body ownership' (the sense, feeling or metacognitive judgement that I am the subject of a voluntary or involuntary movement, or that I am experiencing a certain sensation like touch) and of 'body agency' (the sense, feeling or

metacognitive judgement that I am the cause or author of a movement and its consequences in the world) (Gallagher, 2003; Legrand, 2006).

Indeed, questions such as how we come to experience our body as 'mine' and as "under my control" have received increasing empirical attention in both developmental and adult psychology and cognitive neuroscience over the past, few decades. Several researchers within such traditions have focused on multisensory integration experiments, and other 'contingency detection' paradigms (see Gergely & Watson, 1999; Blanke et al., 2015 for reviews). For instance, some studies have shown that infants as young as 3-5 months, show sensitivity to body-related, proprioceptive-visual *synchrony*, and as motor control develops, also spatial *congruency* (Rochat & Morgan, 1995). In such paradigms, infants tend to respond differentially to experimentally controlled and visually presented feedback of their body parts (e.g. legs) moving synchronously and in spatial congruency (e.g. same direction of movement in space) to their own movements, rather than manipulated visual feedback that does not have these properties (e.g. asynchronous or incongruent movements). A recent study further found that new-borns detect visual-tactile synchrony in stimuli directed to their own faces and were able to discriminate synchrony from visual-tactile asynchrony (Filippetti et al., 2013), in the sense that they showed preferential looking during a synchronous visual-tactile condition in which they were observing a video of an upright infant face being touched in synchrony with their own face, as compared to an asynchronous, temporally delayed condition. This "sensitivity to synchrony" and similar properties are in fact the basis of most multisensory integration paradigms in adults: sensitivity to synchrony (the so called 'glue of the senses') across sensory input allows perceiving subjects to experience unitary multimodal events and to separate stimulation originating from the body versus that arising from the environment, including other agents. For example, hundreds of studies in the past two decades have demonstrated that it is possible to experimentally induce illusory feelings of body ownership in healthy adults. These illusions involve self-identification with another person's face or hand induced by synchronous visuo-tactile stimulation between the own and the other's face or hand. For instance, during the rubber hand illusion (RHI; Botvinick & Cohen, 1998), observing a rubber hand being stroked and at the same time experiencing one's own unseen hand being stroked in synchrony typically elicits the sensation that the rubber hand is one's own hand. Other multisensory integration paradigms have observed changes in the bodily self in relation to isolated body parts such as arms (Fourneret & Jeannerod, 1998), or even the perception of the entire body (Ehrsson, 2007; Lenggenhager et al., 2007). Crucially, the effects of these experimental manipulations are not

measured only by explicit, introspective judgements of the tested participants. Rather they involve so-called 'implicit' tasks in which pre-reflective aspects of bodily awareness are thought to be captured by behavioural measures. For instance, in the RHI, in addition to providing subjective ratings, participants are asked to point with their other hand where in space they think their own 'hidden' hand is. Unbeknownst to the participants, the findings indicate that following synchronous visuo-tactile stimulation they tend to point to a false position, biased by position of the rubber hand (the so-called 'proprioceptive drift' measurement of the illusion). Such studies have concluded that the concurrence of primary tactile and visual input strongly influences the incorporation of body parts within the psychological self, i.e. it contributes to the feeling that these bodily parts are *mine*.

Despite however the success of such experimental investigations, these studies in healthy volunteers are by necessity constrained by the duration and setup of the experiment. To date, neuropsychological disorders that entail relatively long-lasting and biologically induced abnormalities in the subjective experience of body awareness represent an additional, indispensable window of insight into the neurocognitive mechanisms underlying such subjective feelings. The present thesis will focus on a prototypical disorder of the bodily self, namely (a) **anosognosia for hemiplegia** (AHP), i.e. a patient's apparent unawareness of their paralysis or, of other sensorimotor deficits following stroke. This condition can sometimes be also associated with disturbances of body ownership (DSO), i.e. a subset of patients with AHP also present with disruptions in their sense of body ownership, such as asomatognosia (misrecognition or 'loss' of one's own body parts) and somatoparaphrenia (attribution of one's body parts to other individuals or vice versa). The thesis uses clinical observations, behavioural and neural data from these specific neurological aberrations of self-awareness to explore the pre-reflective and intersubjective nature of the minimal self, as well as the formation of the reflective self on this basis. It is envisioned that the study of the pathologically exaggerated ways in which we experience our own body can provide insights into everyday self-awareness and its relevance in counselling psychology. Before proceeding to introduce such studies in greater detail however, it is necessary to take a step back and consider the neurological, neuropsychological and clinical background of this interdisciplinary thesis.

1.2.3. The Cognitive Neuropsychology of Anosognosia for Hemiplegia

Clinical Presentation

A little more than one hundred years ago Babinski (1914) coined the term anosognosia (from the Greek, α = without, νόσος = disease, γνώσις = knowledge, somewhat breaking the tradition that would have expected this phenomenon to be described as 'noso-a-gnosia' in a similar fashion to colour or form agnosia) in order to describe the reports and behaviours of right brain damaged patients with contralesional hemiplegia who denied their paralysis and acted accordingly (see Jenkinson & Fotopoulou, 2014 *Cortex* for the 100 year anniversary special issue). It is now known that anosognosia may occur in various neurological conditions such as stroke, traumatic brain injury, multiple sclerosis, Parkinson's disease, Huntington's disease and Alzheimer's disease (for recent reviews see Heilman, 2014; Starkstein, 2014; Nurmi, Laihosalo & Jehkonen, 2014). This thesis will focus primarily on anosognosia for hemiplegia (AHP; apparent unawareness of paralysis following stroke), a prototypical case of unawareness. AHP occurs more frequently following right hemisphere damage (although left hemisphere cases have been noted and it remains debatable whether language problems mask the symptom in left hemisphere cases (Cocchini et al., 2009), or it is a matter of function reversal (Baier et al., 2014); see also below), usually in the frontoparietal and insular cortices, but the role of temporal lobe lesions and the limbic system is increasing recognised (Vocat et al., 2010; Moro et al., 2011). AHP has also been reported following predominately subcortical (e.g. basal ganglia) and left hemisphere lesions (Pia et al., 2004; Orfei et al., 2007; Cocchini et al., 2009).

In the first decades following the naming of this symptom by Babinski (1914) several studies offered rich clinical descriptions of AHP and related symptoms (e.g., Gerstmann, 1942; Weinstein & Kahn, 1955). Such clinical descriptions portrayed a complex syndrome, including a varied pattern of deficits and manifestations. For example, some patients may admit their deficits but minimise their practical or emotional importance, a condition termed anosodiaphoria (Critchley, 1953). Others do not acknowledge any disability despite obvious evidence to the contrary (Feinberg and Roane, 2003). They may, for example, claim that they can walk, run or dress on their own, although they are completely paralysed in half their body and unable to even stand on their own. Some patients show a strong hatred towards their paralysed limbs (misoplegia; Critchley, 1953) or exasperation with some irrelevant, minor disappointment (Kaplan-Solms & Solms, 2000; Weinstein & Kahn, 1950; Fotopoulou & Conway, 2004). Furthermore, some patients claim their limbs have moved even upon demonstration of the opposite (illusory movements, Feinberg et al., 2000), while others admit

their on-line failure, but fail to update their long-term or, 'off-line' body awareness (e.g. Moro et al., 2011). In terms of symptom specificity, it seems that some patients deny only their plegia (Marcel et al., 2004), while others may show a more generalised unawareness of deficits (Orfei et al., 2007).

A subset of patients with AHP show a variety of disturbances of *bodily ownership* (DSO, also described by some as somatoparaphrenias; Gerstmann, 1942), including rejecting the ownership of the limb (asomatognosia), or, misattributing it to others, or vice versa, claiming they have three or more arms, or legs (supernumerary limb) or, treating the limb as though it was a separate person (personification; Critchley, 1953). The issue of whether these later disturbances of body ownership should be considered distinct disorders of body representation or clinical phenomena caused by the same, underlying deficits and lesions as those that lead to AHP remains a debated issue (e.g. compare Invernizzi et al., 2013 with Karnath & Baier, 2010). More generally, there is on-going debate in neuropsychology and cognitive neurology as to whether the above described anosognosic phenomena are manifestations of independent abnormalities, or caused by common aetiological factors (see below; see also Fotopoulou, 2014 for an extensive review).

Incidence and Assessment

Approximately 58% of right-hemisphere strokes (in the Western world) lead to some form of motor unawareness at acute stages (Cutting, 1978; Bisiach et al., 1986), including severe verbal (14% - 26% of all right-hemisphere strokes, Karnath et al., 2005; Spalletta et al., 2007) and behavioural AHP (e.g. attempting bimanual tasks, 25 - 28% of all right-hemisphere strokes, Cocchini et al., 2010; Hartman-Maier et al., 2001). However, the precise prevalence of AHP and related disorders depends on the assessments and measures used to diagnose and describe such symptoms, the selected patient sample, assessment time and subtypes of anosognosia considered (Jehkonen et al., 2006; Nurmi et al., 2014). For example, 41 different measures have been identified and used in the past 35 years (Nurmi et al., 2014), with some of them leading to different conclusions regarding the occurrence of AHP. For instance, Vocat and colleagues (2010) reported that the prevalence of AHP was higher when assessed with a verbal scale developed by Bisiach and colleagues (1986) than with the scale developed by Feinberg and colleagues (2000). Moreover, while traditional methods showed that AHP

occurred in 10% of all patients (as assessed with scales such as the Bisiach et al., 1986 procedure), using a procedure designed specifically for language impaired patients, AHP could be detected in 40% of the same patients (Cocchini et al., 2009). For the above reasons, in the present study, I used two different scales for the assessment of AHP and included only patients with right hemisphere lesions. Indeed, it has been suggested that AHP should be investigated in largely homogenous patient groups since deficits of unawareness can imply different processes in different patient populations (Jehkonen et al., 2006, Starkstein et al., 1992; 2014).

1.2.4. The Neuropsychological Aetiology of AHP

'Feedback Theories' and Cognitive Neuropsychology

AHP typically appears in the context of a number of concomitant sensorimotor and cognitive impairments (see Orfei et al. 2007; Starkstein et al., 1992; 2014 for recent reviews). During the 1980s and 1990s studies in cognitive neuropsychology attempted to establish whether any of these deficits or any given combination of deficits could explain the occurrence of one or more of the above anosognosic phenomena. While, however, several primary sensorimotor deficits and many higher order deficits such as intellectual impairment, memory loss, confusion, reasoning deficits, dysexecutive symptoms, visuospatial or, personal neglect (see below for definitions), have all been reported frequently in patients with AHP, double dissociations between AHP and most of these deficits have been noted in both acute and chronic AHP (e.g. Bisiach et al., 1986; Marcel et al., 2004; see Orfei et al., 2007; Jehkonen et al., 2006; Vallar & Ronchi, 2006; for reviews). Moreover, Marcel et al. (2004) found that neither sensory loss, nor intellectual impairment, nor their combination provides a complete explanation of AHP. Given the logic of modular neuropsychological inference (see Fotopoulou, 2014 for critical review), such results mean that these deficits cannot be considered necessary for AHP to occur; hence, they have been theoretically de-emphasized in favour of top-down motor explanations (Berti et al., 2005; Heilman et al., 1998), or 'combination' theories (see below). However, based on alterative dynamic conceptualizations of AHP (e.g. Fotopoulou, 2014), it may be more accurate to assume that while AHP cannot be explained as a secondary consequence of any such deficits, they may be viewed as predisposing or aggravating factors and hence they need to be measured and considered carefully in each study. Accordingly, formal neuropsychological and neurological assessment of all patients was included in the methods of the present thesis.

Feedforward Theories and Cognitive Neuroscience

In the last two decades, theoretical and technological progress within the neurosciences allowed topics such as consciousness, agency, and 'the self' to enter the mainstream of research in cognitive neuroscience. In this context, researchers in cognitive neurology and neuroscience quickly realised that the rare and phenomenally rich body awareness aberration seen in AHP and related disorders represent a unique source of insight into the neurocognitive processes of human motor and body awareness. As a consequence, the study of AHP and related disorders got a cognitive neuroscience 'make over', which included the application of well-controlled, psychophysical experiments (see Jenkinson and Fotopoulou, 2014; Fotopoulou, 2014 for reviews) and improvements in structural neuroimaging methods allowing group lesion mapping studies to identify brain lesions selectively associated with AHP (Berti *et al*. 2005; Karnath et al., 2005). Perhaps most importantly, new theoretical hypotheses were put forward, stemming from philosophical or computational approaches on motor and embodied cognition. For example, delusional beliefs such as somatoparaphrenia were now regarded and experimentally tested as specific disorders of the multisensory processes that underlie the conscious sense of body ownership (see Vallar & Ronchi, 2009 for review). Similarly, AHP was regarded as a specific disorder of anticipatory motor awareness rather than a secondary consequence of deficits in other domains (e.g. Heilman et al., 1998; Frith *et al*., 2000; Berti et al., 2005; Vallar & Ronchi, 2006).

This latter view of AHP was based on computational models of motor control (for review, see Frith, Blakemore & Wolpert, 2000). . These models propose that the central nervous system contains a number of comparators, one of which monitors the congruence between intended and actual movement. Normally, an internal predictor, or 'forward dynamic model', uses an efference copy of motor commands to anticipate the expected sensory consequences of an intended movement. Awareness mainly relies on these motor 'feedforward' predictions, whereas actual sensory feedback may not be necessary to construct motor awareness, as long as the overall goal of the movement is achieved (Fourneret & Jeannerod, 1998). Thus, this model implies that whenever the motor system makes a sensory prediction about an intended movement, awareness that this movement has been performed may automatically be constructed (Berti et al., 2007). When intended movement is performed as planned, these sensory predictions match actual sensory feedback, and this awareness of

execution is not challenged by the system. Errors in the execution of intended movements produce a mismatch between the expected and actual sensory feedback, and an error signal at the comparator, which can be used to inform and update awareness.

Several authors have utilised these computational models to propose modular explanations of AHP. Heilman and colleagues (for review see Heilman, Barrett, & Adair, 1998) have proposed that AHP arises from a failure to form motor intentions which thus means that the comparator is not primed by the forward model to expect movement and hence patients never discover that they have not moved. Frith, Blakemore and Wolpert (2000) propose an alternative account of AHP, in which patients are able to compute motor commands and predict the expected sensory consequences of intended movements. However, patients with AHP have the erroneous experience of having initiated a movement because of their failure to register the discrepancy between predicted and actual sensory feedback. Thus, this account aims to account not only for the fact that patients are unaware of their motor failures (a negative symptom), but also of the observation that they have a non-veridical awareness of having moved (illusory awareness), when no such movement has been produced (a positive symptom). Berti and colleagues (Berti et al., 2007) follow Frith and colleagues in proposing that patients are unaware of the discrepancy between intended and actual movement, however they take a step further and suggest that this failure to detect discrepancies is the result of damage directly to the comparator mechanism, and not visuospatial neglect or other sensory deficits (as originally suggested by Frith et al., 2000).

Indeed, the latter explanation by Berti and colleagues has since received much empirical support in neuroanatomical and behavioural studies (see Jenkinson & Fotopoulou, 2010 for a detailed review). On the basis of an innovative lesion mapping study (Berti et al., 2005), this group showed that the brain areas involved in monitoring the correspondence between motor commands and sensory feedback (i.e., Brodmann premotor areas 6 and 44; the insula cortex), are selectively damaged in patients with AHP, while areas typically responsible for motor planning (e.g. supplementary motor cortex) are intact in these patients. This as well as other groups also found physiological (Berti et al., 2007; but see Gold et al., 1994) and behavioural (Garbarini et al., 2012) evidence for the presence of intact motor intentions in AHP. However, to our knowledge the direct relation between motor intention and motor unawareness, i.e. the question of whether the phenomenal content of patients' non-veridical awareness reflects feedforward signals about motor intentions, has never been investigated. Inspired by

phenomenological theory of body perception (see below), this hypothesis was assessed in the present thesis (see Chapter 4).

More generally, despite the clear value of this hypothesis, it quickly has become apparent that a strictly modular, motor explanation is not sufficient to account for all the manifestations of AHP within, or across patients. For example, such theories cannot explain why mood induction can temporarily improve AHP (Besharati, Forkel, et al., 2014), nor account for the extension and partiality of AHP (see above). Indeed, recent experimental studies have shown that awareness dissociations between and within patients are linked with different lesion patterns, including limbic areas non-associated with motor functions. Specifically, three independent, group investigations have found that some AHP patients show behavioural awareness into their deficits despite verbal unawareness (Moro et al., 2011), while other patients show the opposite pattern (Cocchini et al., 2010; Moro et al., 2011). Importantly such dissociations are linked with differences in lesion sites. Similarly, in a voxel-based lesion-symptom mapping study, Vocat and colleagues (2010) demonstrated that the neuropsychological and neural profile of AHP patients' changes in time, and different lesion patterns are associated with AHP at different time points. These studies point to a heterogeneous and multi-component disorder occurring due to lesions affecting a distributed set of brain regions, including the insula, premotor and parietal regions but also subcortical areas such as the thalamus, basal ganglia and limbic structures.

More broadly, a number of authors have noted that AHP sometimes has delusional features that cannot be explained solely on the basis of sensorimotor deficits (for discussion, see Ramachandran, 1995; Solms, 1999; Vuilleumier, 2004; Frith et al., 2000; Fotopoulou, 2010; Turnbull, Fotopoulou, & Solms, 2014). Feedforward theories are valuable in explaining the *illusion* of moving, but AHP patients do not simply claim that they have the phenomenal experience of moving. In fact, typically patients with AHP do not spontaneously complain of any related, subjectively perceived symptom, whether negative (e.g. I am not moving) or positive (I have the impression that I am moving). On the contrary, AHP is diagnosed on the basis of questioning during which patients are typically asked to report on their current experiences (confrontation questions) and infer their more general motor abilities (see also Marcel et al., 2004). Even patients who report illusory experiences of movement during confrontation and hence presumably base their inferences on such impressions (Feinberg et al., 2000), nevertheless simultaneously ignore the wealth of contrary evidence and medical signs

indicating that they are paralysed (e.g. their medical results, disabilities, occasional accidents and others' feedback). This perceptual 'selectivity' is not the same as the one observed in other symptoms such as hemispatial or personal neglect. Indeed, despite the misleading name of 'neglect', this neuropsychological symptom is defined as a deficit in attention to one side of space, so that the person shows an inability to process and perceive stimuli on one side of the body (personal neglect) or the environment (visuospatial neglect), where that inability is not due to a lack of sensation, or aberrant beliefs, or feelings. If stimuli, or even body parts are brought to the non-neglected side then typically their perception improves. Moreover, patients with neglect can become aware of the fact that they have neglect after their errors are demonstrated to them. They then continue to preform such errors but they are not surprised or in denial when these errors are pointed out to them again. In fact, the subset of patients who cannot become aware of their neglect would be diagnosed as anosognosic for these deficits (i.e. anosognosia for neglect instead of for hemiplegia).

Moreover, as aforementioned, there is now also experimental evidence that patients with AHP maintain their denial even after they themselves had admitted their paralysis momentarily (e.g. Besharati, Forkel, et al., 2014). It can thus be said that they adhere to the delusional belief that they have functional limbs. The explanation of the latter belief requires the postulation of additional dysfunction that prevents sensorimotor and other failures to be re-represented at a higher level of cognitive self-representation. Indeed, if one accepts that anosognosia has delusional features then theoretical loans from the literature on delusions can be allowed (see Fotopoulou, 2010 for review), and particularly the ongoing debate between one and two-factor theories. According to the former, rational reasoning on the basis of anomalous or unusual experience should be sufficient to ultimately lead to refractory, delusion beliefs (e.g. Maher, 1992). By contrast, two-factor theories claim that delusional beliefs cannot be explained without the role of additional, cognitive dysfunctions such as reasoning biases, or monitoring deficits that are necessary for the generation and maintenance of the false beliefs (e.g. Davies, Coltheart, Langdon, & Breen, 2001). Indeed, also in the literature on anosognosia, a third set of recent theories emphasise that the explanation of anosognosic beliefs and attitudes requires the postulation of additional dysfunctions that prevents sensorimotor and other failures to be re-represented at a higher level of cognitive and emotional self-representation, beyond the sensorimotor domain. These are reviewed below.

'Combination' Theories

In the light of the above limitations in both 'feedback' and 'feedforward' theories, some authors proposed multi-factorial theories of AHP, according to which in different patients, the combination of different sensory and different higher-order cognitive impairments may cause different subtypes of AHP. For example, according to Levine's discovery hypothesis deficits in inferential reasoning superimposed on sensorimotor deficits such as proprioception loss may prevent patients from 'discovering' their disabilities (Levine, 1990; Levine, Calvanio, & Rinn, 1991), or their momentary discovery may not be 'remembered' (Moro et al., 2011).

Indeed, given the increasingly recognised heterogeneous and multifaceted nature of AHP, several groups (e.g. Vuilleumier, 2004; Davies et al. 2005; Orfei et al., 2006; Cocchini et al., 2010; Garbarini *et al*., 2012; Mograbi et al., 2012) have recently suggested a revival of cognitive theories that implicate two or more contributory factors, usually some higher order, top-down impairment superimposed on some sensory deficit (*cf*. the discovery theory of Levine *et al*., 1991). For example, as mentioned in the section above, considering AHP in the more general context of delusional beliefs, Davies and colleagues (2005) proposed that anosognosic beliefs may be explained by a two-factor account used to explain other delusions; abnormal beliefs arise due to a first impairment in perception that prompts the abnormal belief and a second impairment that interferes with higher-order, monitoring processes thus allowing the abnormal perceptions to become abnormal beliefs. Similarly, Vuilleumier (2004) put forward an "ABC model" of awareness, where a combination of processes involving 'appreciation', 'belief', and 'check' operations might normally support motor awareness and combined damage to two or more of these processes can cause the different types of anosognosia observed in different patients.

These accounts have been undoubtedly useful in emphasizing the multifaceted nature of AHP, and for attempting to link the understanding of anosognosic behaviours and beliefs with insights about the cognitive processes that may underlie normal and pathological belief formation (see also Fotopoulou, 2010; 2012 for discussion of this point). However, these accounts have been criticized for not being falsifiable (Vallar & Ronchi, 2006). Moreover, reflecting the modular epistemology of cognitive neuropsychology (Fotopoulou, 2013 for a critical review), these models treat the described deficits as simply 'additive' and as potentially caused by simultaneous damage to functionally independent lesion sites. For example, Vocat et al. (2010) suggested that a combination of lesions to two or more brain areas within the insular, premotor, parietal and temporal cortex, or the white matter connections that link one

or more of these areas with subcortical regions, may lead to different combinations of deficits in functions such as proprioception, spatial neglect, and error monitoring, which in turn lead to AHP in different patients. While such 'combinations' of lesion sites and deficits are consistent with the multifaceted nature of AHP, what these accounts lack is a more precise neurobiological and neuropsychological description of the relation between the affected areas and their integrated functional role in body awareness. More specifically, what these accounts lack is a more precise psychological and neurobiological description of the *dynamic and hierarchical relation between the proposed deficits.* This lack of integration is particularly evident in the case of emotional and other psychosocial factors that have long being proposed in the literature on anosognosia, but to our knowledge have not been integrated with the proposed neurocognitive theories, as described below.

1.2.5. Classic Psychodynamic Explanations of Anosognosia

Although a plethora of studies have been dedicated to the nature of brain damage and the cognitive dysfunction accompanying AHP (as outlined above), few studies have considered psychosocial dimensions of AHP. Some theorists, influenced by psychodymanic theories, have proposed that neurocognitive deficits are less relevant to AHP than suggested by cognitive neuropsychologists, and that instead, psychological factors should be considered as its primary causes. For example, Weinstein and colleagues have claimed that AHP is a form of psychological denial of one's deficits – a defense mechanism against the overwhelming anxiety of being ill and paralysed (Weinstein & Kahn, 1955). According to this theory, one's personality and previous coping strategies are important in causing and colouring the anosognosia (see also Gainotti, 1972). These psychological descriptions were however based on outdated 19th century psychoanalytic models of the mind and thus not integrated with, or checked against current psychological knowledge. More generally, a kind of dualistic, polarisation has dominated the field. At the one extreme, psychogenic hypotheses suggest that AHP reflects defense mechanisms against anxiety and depression (Weinstein, 1996). At the other extreme, neuropsychological explanations have suggested that all features of AHP can be explained on the basis of specific neurocognitive deficits (e.g. deficits in forward motor planning; Heilman et al., 1998). Some have opted for proposing that a kind of dualism between different patients with anosognosia; they suggested that some patients with AHP may actually show psychological 'denial', while others may instead have a 'genuine' unawareness

(Prigatano, 2014). From the neurophenomenological perspective of this thesis, these dualistic perspectives regarding the aetiology of anosognosia portray fundamental 'disembodied' perspectives regarding cognition and self-awareness. In other terms, damage to the body, be that in the periphery or the central nervous system, is by definition also of consequence to self-awareness and other psychological abilities, given the embodied nature of the latter. It is precisely such perspectives, and their implication for counselling psychology and psychotherapy, that motivate the investigations of the present thesis, as outlined below.

1.2.6. Anosognosia in the Clinical Context

Although AHP is often a transient phenomenon, with patients spontaneously recovering within weeks or months from onset, recent reviews suggest that approximately 30% of reported anosognosic patients remain unaware of their deficits beyond the acute phase of their illness (Pia et al., 2004; Orfei et al., 2007). Importantly, even if AHP is limited to the acute stage of post-stroke recovery, its occurrence at this critical stage is a major obstacle in acute rehabilitation settings, as it can impede motor rehabilitation (Gialanella et al., 2005) and obstruct more general recovery, as follows. The acute stage of recovery is the period in which the brain re-organises itself, and at this time, prompt interventions (both motor and psychological) are of critical importance. However, patients with AHP may fail to see why they should comply with treatment requirements (they cannot see why they should try to 'rehabilitate' a problem they do not believe they have), and often direct feedback, invitations of cooperation or efforts at distraction are ineffective as patients adhere more firmly to the 'truthfulness' of their false claims (Prigatano, 2010). Thus, AHP can lead patients to refuse acute medical treatments that considerably improve prognosis (Di Legge et al., 2005; Cherney, 2006), to avoid appropriate safety measures (Hartman-Maier et al., 2001, 2002) and to be unrealistic about their rehabilitation, housing, social and financial needs (Orfei et al., 2007; Prigatano, 2010). Moreover, patients are typically unaware of their own errors in judgement and may be so convinced of the truthfulness of their false claims that they act upon them. This poses great risks, as patients may attempt to get out of their beds and they tend to harm themselves from falls and other accidents more frequently than other stroke patient groups. As a result of all these difficulties, unawareness is linked to longer hospital stays (Maeshima et al., 1997), less likelihood of independent living (Pedersen et al., 1996), lower scores on measures of functional recovery (Gialanella et al., 2005; Maeshima et al., 1997) and activities of daily

living (ADL) (Maeshima et al., 1997). In fact, the impact of unawareness on ADL and functional outcomes is significant even when controlling for the extent of other cognitive deficits (Hartman-Maier et al., 2001). Thus, unawareness in acute stages is a specific, negative prognostic sign, compromising the course of recovery and rehabilitation and limiting the potential for future independence and well-being.

Notwithstanding these unique clinical challenges that AHP raises, there is currently no specialised provision for the psychological treatment or management of AHP and related disorders in most Western countries. This is not uncommon for neuropsychological symptoms at acute stroke services in the UK. Despite recommendations (National Sentinel Audit of Stroke, 2008; BPS Briefing Paper No. 19, 2002) and an increase in whole time equivalent (WTE) clinical psychology posts, such that now 54% of hospitals have some clinical psychology service, many stroke services have adequate access to specialist psychological services and when compared to absolute numbers of staff per stroke unit, clinical psychology input remains pitiably small with a median of 0.04 WTE per ten beds (National Sentinel Audit of Stroke, 2012)**.** There is also a lack of systematic research into acute, post-stroke neuropsychological rehabilitation (Cheeran et al., 2009); a recent systematic review of interventions designed to improve functional ability in people who have cognitive impairment following stroke could identify only four studies (Hoffman et al., 2010). Patients with cognitive difficulties are typically excluded from rehabilitation studies on functional outcomes. This lack of provision and research is reflected in what patients themselves report; psychological problems and information about stroke are among their most frequently unmet needs in post-stroke care (McKevitt et al., 2011).

Thus, similarly in the case of AHP and somatoparaphrenia no evidence-based treatment exists, the provision of counselling and psychotherapy constitutes an exception (e.g. Kaplan-Solms & Solms, 2000) and most research on the topic has not hitherto been clinically pertinent (Kortte & Hillis, 2011; see Prigatano & Morrone-Strupinsky, 2010 and Jenkinson, Preston & Ellis, 2011, for reviews). There have only been a handful of studies on the psychophysical and cognitive rehabilitation of acute AHP. Specifically, remission of AHP has been reported using vestibular stimulation but the effects of the stimulation last only a few hours at best (Rubens, 1985; Cappa, Sterzi, Vallar & Bisiach, 1987). An alternative combination of treatments has

also only led to transient improvement of awareness (Beschin, Cocchini, Allen & Della Sala, 2012). Specifically, three treatment techniques that have traditionally been shown to temporarily improve neglect (optokinetic stimulation, prism adaptation and transcutaneous electric nerve stimulation) have been applied to the treatment of five patients with both anosognosia and neglect, with left and right hemisphere damage between 50 and 70 days post onset. The results indicated that patients responded differently to treatments; anosognosia but not neglect temporarily improved in one patient, while only neglect improved in two other patients and there were no effects in the rest.

Finally, in a review of the few rehabilitation efforts in AHP in several countries, Prigatano and Morrone-Strupinsky (2010) outlined some practical guidelines for the management of unaware patients. Firstly, the severity, 'types' of AHP and the associated neurological and neuropsychological deficits should be clearly determined. Good rapport with both the patient and the family should then be established. Lastly, they suggest that a detailed and individualized rehabilitation plan should be developed, including counselling and psychotherapy where available and appropriate (also see Jenkinson et al., 2011). Unfortunately, such recommendations have not been taken up in the U.K., where clinical, or counselling psychologists, or even psychotherapists are not typically available to stroke survivors at acute and post-acute stages of recovery.

1.3. Relevance to Existential, Counselling and Psychotherapeutic Psychology

As I have outlined above, the traditional scope of counselling psychology and psychotherapy does not involve treating patients with acute brain damage. In the UK, most patients with brain damage are not offered psychotherapy at the acute stages and frequently the potential risk of psychological consequences of brain damage, both cognitive and emotional, are not even properly explained to them. This is highly paradoxical as brain damage has known direct and indirect effects on psychological states. For example, brain tissue damage can lead to an inability to process specific self-related and important personal memories, or to an inability to perceive, experience and/or express emotions. In addition, the devastating medical reality and lifestyle change of brain damage may have indirect effects on one's psychological state. Nevertheless, these patients are not offered therapy and if they are there are no special provisions regarding their particular symptoms. Indeed, beyond the general recommendations

mentioned above, there have been very few studies trying to bridge the gap between basic research into the nature of AHP and the clinical, psychotherapeutic needs of patients (see above section). As briefly mentioned in the Introduction, one of the reasons for this health care neglect may be the association of brain damage with old-fashioned medical traditions in neurology, which view psychological factors and changes as unrelated to brain function. In addition, within psychology, psychometric traditions are concerned with objectifying cognitive deficits following brain damage based on available psychometric batteries (e.g. intelligence and memory tests), at times with less concern or ability to explore the emotional state and subjective experience of the patient. The latter are harder to quantify in such settings and most stroke teams do not ask for such assessments.

In this context, the proposed research aims to make specific contributions to the understanding and psychotherapeutic treatment of patients with stroke-induced anosognosia for hemiplegia. This condition has been termed as unintentional by neurologists and as unrelated to patients' wishes and emotional struggles (Bisiach and Geminiani, 1991). Also, these patients are considered emotionally indifferent and unable to experience negative emotions consistent with their paralysis (see Turnbull et al., 2005 for a critical discussion). Thus, the need for psychotherapy is not obvious. However, some attempts to provide psychotherapy to these patients have shown that these symptoms are not only linked with very powerful emotions, but also the apparent emotional indifference in these patients is only superficial and the establishment of a good therapeutic rapport reveals a wealth of psychological attempts to cope with and make sense of the consequences of brain damage (Kaplan-Solms and Solms, 2000). I thus believe that an interdisciplinary inquiry into the embodied experience of these patients as seen in a general in-patient stroke ward may uniquely contribute to the wider understanding that patients' needs for psychotherapy may be added to their needs for speech therapy, occupational therapy and physiotherapy that are routinely offered in such wards.

There are also two further points of importance for counselling psychology. First, given that these disorders directly affect the very fabric of self-awareness and self-reflection (not to mention other aspects of cognition, such as emotional communication, see also Chapter 2), and arguably also social relating and cognition (see subsequent chapters for details), it is not given

that therapists can proceed in understanding and helping patients with a standard psychotherapeutic and counselling approach. Instead, a thorough investigation of self and other awareness in these disorders could offer insight not only into the nature of self-awareness but also on the special challenges that face counselling psychology and psychotherapy in the context of right hemisphere stroke and neurological disorders more generally.

Second, given the counterintuitive and in certain respects paradoxical (see Chapter 3) nature of anosognosia, I will argue that its examination from both empirical and existential-phenomenological perspectives holds the potential of elucidating some the paradoxes that are implicit in the human condition more generally, and particularly in the intertwined relation between our embodiment and our consciousness. As I will discuss in each chapter of this thesis, the fact that the consequences of this relation are grotesquely exaggerated in anosognosia, allows one to examine them from a unique perspective and thus reflect on how existential, counselling and psychotherapeutic psychology can position its practice in relation to some of these paradoxical ways of being-in-the-world and the everyday challenges they entail for the individual and for therapy.

1.4. Overview of Aims and each Chapter's Objectives

In the above context, I aimed to explore from an interdisciplinary vantage point the way in which the body is experienced in people with AHP following a stroke. As aforementioned, I am motivated predominately by philosophical views on embodied cognition and the minimal self, and Merleau-Ponty' s (1945/1962) perspective on the role of embodiment for the structuring of experience, including the experience of one's own body as the agent and owner of actions. Moreover, it will attempt to follow Merleau-Ponty's epistemological stance, and more recent proposals in the field of 'neurophenomenology' (Varela et al., 1991; see Chapter 2 for details) in exploring theoretically and empirically the phenomenon of AHP from an interdisciplinary perspective, using quantitative research methods from neuropsychology to investigate the nature of body awareness following a stroke, while at the same time using theoretical insights from phenomenological-existential perspectives to generate novel hypotheses about the embodied experience of such patients.

Specifically, the empirical part of the thesis will begin with an overview of the psychometric, neuropsychological and neuroimaging mythologies used across the rest of the

chapters of the thesis, including the patient characteristics and recruitment criteria used for the study (Chapter 2).

This will be followed by a group study (N = 14) on AHP (Chapter 3) exploring the novel, existentially-informed hypothesis that patients with AHP have a tacit awareness of their deficits, despite their conscious unawareness. The aim of this chapter would be to experimentally explore the possibility of tacit awareness in these patients, as relating to Merleau-Ponty's insight regarding the two, deeply intertwined aspects of our embodied awareness of the world, namely the prereflective, habitual body and its potential for action and the reflective, conscious perception of the world, and the body in it, as a thing in itself. The findings will be discussed in both the neurocognitive and philosophical literature and their implications for existential counselling psychology will be explicitly addressed.

The following chapter, Chapter 4, will build upon the findings of Chapter 3, trying to experimentally establish in another, psychophysical group study on a subset of the above patients (N = 8) whether such forms of prereflective awareness into one's paralysis may actually influence patient's explicit unawareness**.** Indeed, contrary to cognitive theories on such phenomena, in Merleau-Ponty's (1945/1962) understanding, the denial of one's motor deficits does not exist despite of one's pre-reflective understanding of the same deficits, but rather because of it; specifically, it is the patient's more general commitment to the world as the body itself 'knows' it tacitly, habitually and practically that drives one to deny one's paralysis in a more abstract, reflective terms. The findings of this chapter will be discussed in both the neurocognitive and philosophical literature and their implications for existential counselling psychology will be explicitly addressed.

The following and last empirical chapter consists of a case study aiming to assess whether insights generated by the above two studies could be translated to a psychophysical intervention that can help a patient with AHP recover her reflective awareness of her paralysis. Specifically, a video replay is used to provide 'off-line' and 'third-person' feedback of the patient's body and action attempts, while the researcher offers opportunities for reflections on the observed video. The results of this study are discussed in relation to scientific and philosophical theories of self-awareness but most importantly in relation to clinical challenges and the scope of existential counselling psychology. Finally, the thesis concludes with a wider theoretical discussion of the present findings, their epistemological and ethical challenges and

most importantly their implications for the more general paradox in counselling psychology and psychotherapy of clients who seek therapy in order to change their habitual ways of being in the world while at the same time being very committed to these very ways.

2. Epistemology, Methodology and General Methods

2.1. An Existential-Phenomenological Enquiry with Quantitative Research Methodology: A Paradoxical Choice for a Paradoxical Phenomenon

This thesis rests on a fundamental epistemological paradox. It assumes that our first-person, reflective awareness of our own body hides, by its very nature, the influence of a different, habitual, practical, prereflective awareness that is best revealed when one examines breakdowns of our reflective ability. Accordingly, the focus of the thesis will be on how our reflective awareness of our body is compromised by brain damage. How can one thus use first-person methods that rely on reflection when working with patients with compromised reflective abilities? This section unpacks this paradox.

Self-awareness, and more generally consciousness, is assumed to be a first-person experience (see Chapter 1), irreducible to the third-person accounts and thus requiring a first-person epistemology (how we come to know the world on the basis of our own experience). Such epistemology is advocated by transcendental phenomenology (Husserl, 1929/19**77**; particularly as interpreted by Varela et al., 1991; Gallagher, 1995), existential phenomenology (e.g. Heidegger, 1927/1962; Merleau-Ponty, 1945/1962) and several other philosophical, as well as psychological approaches, psychotherapeutic practices and qualitative research traditions (e.g. Interpretative Phenomenological Analysis; Smith et al., 1999). Indeed, the field of counselling psychology is characterised by such epistemological principles, originally encountered in humanism, in both practice and research (Woolfe, Dryden & Strawbridge, 2003); human experience and interaction, the wealth of lived experience and its (inter)subjective meaning, cannot be reduced to general, abstract and detached facts generated by a positivistic approach to knowledge that assumes the existence of an 'objective' truth lying somehow 'behind' subjectivity and intersubjective encounters (see below for specification of

these epistemological points and their relation to counselling psychology). Thus, qualitative research methods (mostly relying on second-person methods such as interviews) are optimal and frequent choices for the research-practitioner in counselling psychology. Such methods are particularly chosen as counselling psychologists may wish to take an integrative stance (Hollanders, 2003) between some of the demands of psychological science for systematic study of a phenomenon and 'practice-based values' (Woolfe et al., 2003, p. 8), such as the need for a critical appraisal of science itself, reflexivity, empathic understanding, the recognition of one's own role in the formation of the phenomena under investigation (Woolfe et al., 2003, p. 8).

Yet at the same time most research on counselling psychology focuses on phenomena that can be contained within the mental and social realm, with relatively small explorations of the domain of embodiment. This focus is not so easy when one is interested in the role of embodiment in mental life per se and particularly the role of brain damage in self-awareness. Indeed, if consciousness is best described in first-person terms, how are we to understand its relation to its foundational embodiment, when the body is also to be understood in third-person terms, i.e. as the physical basis of consciousness? Philosophers refer to this long-standing challenge, as the hard problem of consciousness. How can bodily processes, such as for example, neural activity, give rise to subjective feelings? Even more so, how can one study and understand another person's world from a first-person (or, at least a second-person) perspective, when the very faculty (e.g. language, thought, emotion etc.) that allows that person to experience and express themselves appears compromised, if not vanished altogether (see below for specification of these practical limitations in the case of the present thesis)? Should we, as counselling psychologists, engage with such experiences, or are they best left to neurologists and other 'practitioners of the body', such as physiotherapists?

The thesis does not of course attempt to solve the mind-body problem, nor explain consciousness. However, as the thesis attempts to study the embodied foundations of self-awareness, and even more so, it focuses on alterations of self-awareness, following brain damage, such questions lie at the heart of my epistemological approach and thus the latter need some clarification and justification. We have no direct experience of our brains and more generally our bodies 'generating' our conscious world. Given this 'design', many scholars, and popular opinion points to dualism; our experiences are either subjective (i.e. our experience of the feeling of pain) or objective (i.e. the neural processes that correlate with this pain). Despite

its general, explicit rejection in science, Cartesian (ontological) dualism seems implicitly present in science and Western society, as I outlined in the previous chapter. Phrases such as 'there is nothing wrong with him, the pain is all in his mind' are still rather common. Ironically, the epistemological foundations of cognitive sciences (i.e. computationalism and the metaphor of the mind as the 'representational' software of the 'hardware-like' brain) and one of its subfields, namely cognitive neuroscience, are dualistic in their understanding of the mind and consciousness in particular (e.g. Varela et al., 1991 for a critical review). Indeed, many of my fellow cognitive neuroscientists and cognitive neuropsychologists portray a dualism in their everyday practice and their papers (e.g. see Fotopoulou, 2010 for a critical review in relation to false memories). Some philosophers and scientists have been increasingly in recognition of such lingering ontological dualism, and they vary in their proposals of how to mediate the divide epistemologically (Searle, 1990; Chalmers, 1995; Varela et al., 1991). Some advocate a necessary epistemological dualism (i.e. we should study the mind and the brain in independent fields and then form interdisciplinary societies where we can compare notes, e.g. Chalmers, 1995; see also the field of Neuropsychoanalysis, e.g. Solms, 1995; Solms & Turnbull, 2011), while others view this stance as a kind of 'radical nihilism (according to the definition of Nietzsche; see Varela et al., 1991, p. 128) and propose a more 'active', epistemological integration between fields such as phenomenology, cognitive science, Buddhist approaches to mindfulness and neuroscience (Varela et al., 1991). Indeed, the last proposal, known as 'Neurophenomenology' and seen as a continuation of the work of Merleau-Ponty by its founders (see Varela et al., 1991), is crucial for the present thesis, and I outline below how I intend to follow the epistemological path they have suggested in this thesis.

2.2. Merleau-Ponty, the Embodied Mind and Neurophenomenology with Brain Disorders

The original emphasis of phenomenology, as conceived by Husserl, was in exploring experience beyond our natural attitude, i.e. by a systematic attempt to avoid preconceived ideas, fixed categories of thought, with the view of shedding light into the essence of a conscious experience not only in a subjective, but also in a universal sense. Against this background, perhaps more than any of the other classic thinkers Merleau-Ponty emphasised the uniqueness of human embodiment. He called for a return to, a rediscovery of the 'world of perception'; a

restoration of a way of looking at space and the things which inhabit it, both animate and inanimate, including man itself, through perception, as experienced bodily and naively, without being misled by habitual, cognitive categories (Merleau-Ponty, 1948/2004). Following Husserl and other phenomenologists, this rediscovery is put forward as a critique to classical science and rationalism, which according to Merleau-Ponty see perception as no more than the confused beginning (the appearance) of scientific knowledge, or rationality (the reality beyond appearances). Descartes famously believed that even by scrutinising one's senses, one soon discovers that there are no reliable criteria by which to avoid their potential deceit and hence one learns to trust only the intellect (rationalism). Merleau-Ponty offers a reversal of the classic relationship between appearance/reality and perception/science. By doing so he does not wish to return to classical empiricism (nor, scientific logical positivism). Indeed, he defends that thought is more than experience and observation, as Kant argued. There are 'a priori' concepts and structures that 'organise' and form experience. However, Merleau-Ponty emphasises 'the phenomenon of the body' (1945/1962); it is not consciousness (ideas, reflection, cognition, knowledge) that constitute the world, but a body which 'embraces' it. Our embodiment brings to experience an a priori structure. It is our 'bodily intentionality' (not a voluntary, cognitive act but a notion similar to Husserl's 'functioning' intentionality) that ensures our consciousness of space and time, of the world. This is achieved not by the preformed categories of reflection, but by endeavouring to express our pre-reflective experience, a primordial, less articulated form of lived experience. For example, our perception of a glass on a table is prereflectively influenced by our habitual ways of grasping a glass, in parallel to our ability to visually perceive the glass and verbally categorise it as such.

Importantly for the present thesis, this pre-reflective experience cannot for Merleau-Ponty be caught in transcendental reflection, as Husserl proposed. Merleau-Ponty regards this as a kind of Cartesian dualism, which implies that there is a body as a form of matter, which the mind needs to transcend. Thus, he argues against phenomenology as inner subjective experience or, thought. By contrast, the subject is also body for Merleau-Ponty, which of course is also matter, object, part of the world. In his words, 'man is a mind *with* a body, not a mind *and* a body' (1948/2004; p.43). Thus, man can only get to the truth of things because its body is, as it were, embedded in these things.

Crucially for the present thesis, Merleau-Ponty argues that one way by which philosophical enquiry can discover the modes of pre-reflective experience is by examining breakdowns in bodily functions, and particularly brain functions. He argued that we can thus discover the underlying patterns of our normal conscious state that hide their influence; that work at leaving no traces of their 'crime'. As for him the body cannot be reducible to the consciousness of the body, and the role of the body is prenoetic and impenetrable to phenomenological reflection, it must be worked out conceptually in relation to the empirical sciences. Thus, Merleau-Ponty himself indeed examined breakdowns in brain functions, to discover the hidden modes of our pre-reflective experience of the body and the world more generally. In his seminal book, the Phenomenology of Perception (1945/1962), Merleau-Ponty examines among other neurological disorders, the phenomenon of anosognosia for hemiplegia (AHP), i.e. a patient's apparent unawareness of their paralysis following stroke (see below for further details). These enquiries he believed could provide a guide towards restoring the world of perception; discovering the underlying patterns of our normal conscious state. In other terms, failures to the system of bodily self-consciousness reveal how the system normally works when there is no damage.

Of course, it is important to emphasise that Merleau-Ponty is not advocating for a scientific reductionism when he considers the results of empirical studies on brain damage. In the mainstream of traditional neuroscience, the body is conceived as a whole that can be separate in parts for the purposes of scientific scrutiny and analysis, as for example when one is studying the effects of serotonin inhibition on certain brain cells. According to Merleau-Ponty (1945/1962) however the body cannot be understood in such a fragmented manner. Instead, it can only be understood in its totality and historicity, as a lived experience of the world it inhabits. Thus, studying a particular part of the physical entity we call a human body is not equivalent to studying a human body with its history in the whole and corresponding memory. For Merleau-Ponty, natural science has an epistemological value (1948/2004). However, he regards it as knowledge by approximation, an insufficient medium of inquiry into the world. And at a pragmatic level he argues that the issue at stake is not to deny or limit the scope of natural science, but it is a matter of whether it can deny or limit the scope of other, non-scientific enquiries into the world, as it sometimes claims. Most importantly for the presence thesis, Merleau-Ponty argues that although science itself, at least as it is traditionally practiced, is limited in its ability to capture the lived world of the individual, phenomenological

and existential enquires can understand and incorporate scientific insights. To my knowledge, Merleau-Ponty does not offer a specific, practical proposal (as contemporary philosophers do, see below) on how one could actively integrate science and phenomenology, although in his own efforts he certainly 'models' an active philosophical engagement, i.e. he is interested into and studies scientific phenomena carefully, as reported by scientists and clinicians, and in his writings he applies phenomenological and existential perspectives to their theoretical understanding.

According to recent 'neurophenomenological' efforts (e.g. Varela, 1996; Gallagher, 2003), one could take Merleau-Ponty's pioneering epistemological stance even further. Specifically, Varela has argued that instead of trying to integrate cognitive sciences, neuroscience and phenomenology philosophically, i.e. in philosophical reflection, one could follow a more 'active' and pragmatic methodological path (Varela, 1996). He explains that on the one hand, cognitive neuroscientists spent an ever increasing time trying to perfect the third-person behavioural and neuroscientific methods that would allow them to understand how and why experiences arise from neural processes. Although these methods, and particularly experimentation are active engagements with the phenomena to be observed, all these methods are ultimately attempts to correlate observable behavioural changes with observable brain changes, portraying a fundamental mistrust for introspection and reflexivity of either the person being studied or the experimenter itself. On the other hand, philosophers seem to engage with the phenomena in question with little practical engagement, little actual participation. Even many of the modern qualitative research methods used by counselling psychologists portray a minimum engagement of the researcher in the phenomena in question in the sense that the researcher is the interviewer, the observer or the discussant, 'after the fact' or the more precisely the event, or experience that is the focus of the research. There is little, pragmatic 'pocking' of the experience itself.

Varela and colleagues (1991) call this an 'abstract' attitude, which Heidegger and Merleau-Ponty ascribe to both phenomenology and science, and which non-Western Buddhist traditions, and some of the modern 'mindful' approaches, argue is actually the habitual attitude of everyday life. "This abstract attitude is the spacesuit, the padding of habits and preconceptions, the armour with which one habitually distances oneself from one's experience"

Varela and colleagues write (1991; p. 25). They instead advocate for a methodological integration between the practice of mindfulness, capable of reducing such abstract attitude and the active methods of scientific experimentation. Indeed, they considered that the form most closely allied to a pragmatic engagement with experience is experimentation (p. 31). Of course, the latter has been historically tied to positivistic, disembodied perspectives of knowledge, but according to the founders of neurophenomenology, it need not be. Despite inevitable doctrinal disputes and conflictual claims, they argue that a 'mindful' experimentation, one that tries to focus on one's experience beyond the traps of habitual reflection, is possible.

Indeed, some proponents of 'neurophenomenology' have realised this project by trying to adapt traditional neuroscientific methods to achieve better phenomenological enquiries. For example, developing periodic "experience sampling" during experiments (Christoff et al., 2009), using hypnotic suggestion to elicit certain states of awareness (Lifshitz et al., 2013), or harnessing the experience of experimental participants who are already expert at observing and describing their experience, such as Buddhist meditators (Farb et al., 2007; Lutz et al., 2008). Other scholars have realised the neurophenomenological vision in different ways. Some follow Merleau-Ponty in focusing on the philosophical intricacies of the collaboration between phenomenology and cognitive science (Gallagher, 2003), attempting to tackle complex and particularly thorny issues such as the nature of the self (Zahavi & Roepstorff, 2011), or conducting investigations into experiential realms pertinent to clinicians, including the phenomenology of psychopathology, (e.g., Sass et al., 2011), or neuropathology (Mishara, Corlett, Fletcher & Schwartz, forthcoming).

This thesis is most closely allied to the latter methodological path, even if I acknowledge that the thesis will use third-person, experimental methods to infer conclusions about the nature of first-person awareness in patients with brain damage. Specifically, the thesis will attempt to study neurological patients with difficulties in self-awareness by traditional third-person methods, yet shaping and informing active experimental methods by existential and phenomenological insights, and discussing the results from similar interdisciplinary vantage points, including the 'practice-based' epistemological values of counselling psychology (as outlined above). Of course, I acknowledge that such third-person, experimental methods will inevitably reduce the lived experience of the studied individuals to simplistic observations

regarding their behaviour under very specific conditions, dictated by the details and constraints of each of the experiments. This is a form of disengaged research, not taking into account properly the subjectivity of its participants, nor the intersubjective realities at play during the research sessions. In addition, contrary to classic phenomenological requirements of 'bracketing out' pre-established knowledge and rediscovering experience of brain-damage together with my clients and research participants, all experiments are designed after a specific, third-person hypotheses that will to a degree dictate the phenomena to be observed and the conclusions to be made, and which in turn is dictated by my own readings and biases regarding the nature of awareness.

Yet I believe that given the paradox of embodied awareness outlined above, as well as the practical difficulties of interviewing individuals with severe cognitive difficulties due to right hemisphere damage and the acute state of their illness (some relating to awareness per se but others also influencing a number of physical and psychological domains that may be important for taking part in an interview, e.g. fatigue, concentration difficulties, difficulties with the pragmatic aspect of communication, sustained attention, memory, hospitalisation, ongoing medical complications etc.), I believe third-person methods may be justified and have some usefulness in this case. Indeed, I believe it is not an accident that no qualitative studies have been conducted in this population. The usefulness of this approach applies particularly if one (and particularly myself) does not forget that this thesis will not be able to do justice to the subjective perception of the body and one's self in anosognosia, but is aiming rather to offer empirical confirmation to some fundamental existential-phenomenological hypothesis about the mind-body relation, such as the existence of pre-reflective awareness, and to a consideration of such a perspective for counselling psychology.

More generally, following the above epistemological considerations one could argue that notwithstanding their methodological reductionism (see Glossary), such empirical studies could offer, existential-phenomenological perspectives some complementary confirmation in scientific terms into phenomena of mutual interest, such as the issue of prereflective, embodied awareness, considered here. In his own work (e.g. 1945/1962), Merleau-Ponty indeed draws extensively on contemporary empirical studies on the development of children, as well as on brain damage, including AHP, as aforementioned (his theories are covered in greater length in

the various, empirical chapters below). This is the epistemological remit that this thesis follows. It engages in empirical and reductionist methodologies, as traditionally employed by the field of neuropsychology but with an added element of 'experimental 'poking' to systematically probe and study body awareness in patients with AHP. Moreover, instead of relying exclusively on neuropsychological theory for the formation of hypotheses and the interpretation of the results, it takes inspiration from phenomenological and existential theories to generate and reflect upon the minimal self from an interdisciplinary perspective. Such interdisciplinary perspectives are of course not free of epistemological and theoretical tensions, and the empirical parts of the study are mere 'approximations' of the structures that underlie the subjective phenomena in question. However, the thesis follows Merleau-Ponty in arguing that such interdisciplinary engagements offer unique potential in elucidating some phenomena that lie at the crossroads between the bodily (physiological) and the mental (psychological) (1945/1962; p. 92), and may not be as transparent in the 'healthy brain'.

In the following section, I clarify the difficult choices I had to make in the above epistemological background and the practical peculiarities of the phenomenon in question, that ultimate led to the chosen methodology, as well as more generally, my own aspired position within the field of counselling psychology, as it was progressively moulded by my professional background and is constantly shaped by my readings on the theoretical and philosophical foundations of psychology in general and counselling psychology in particular. I return to my role in the research outcomes, against this initial position and epistemological stance, at the Discussion section.

2.3 My Personal and Professional Position in Relation to the Tension between Existential-Phenomenological Enquiries and Quantitative, Neuropsychological Methods

The epistemological approach of this thesis, as well as the choice of its subject matter, is the accumulate result of various, impersonal and practical considerations (e.g. available expertise, facilities, patient access), the values of counselling psychology and the requirements of this degree, but also my own personal and professional background that has shaped my choices and interests until this day. In this latter respect, I think of myself as an aspiring counselling psychologist that is already an established researcher in neuropsychology, albeit

an ambivalent one, with a healthy dose of 'uneasiness' about neuropsychological and scientific methods more generally and a long-standing and 'acted-upon' interest in the humanities and in psychotherapy. Indeed, since my very first steps in the field of neuropsychology (e.g. Fotopoulou et al., 2004; Fotopoulou & Conway, 2004), I have endeavoured to approach the complex clinical issues involved in brain damage with a perspective that transcends the narrow focus of cognitive neuropsychology, as well as its emphasis on rigid psychometric assessment (particularly prioritized by certain sectors of clinical psychology). As I attempt to outline in the reminder of this section, my later turn towards counselling psychology, and existential-phenomenological perspectives in particular (I started my training in 2008), is motivated by this need to formalise and reflect upon my experiences and interests in this challenging, clinical field, and more generally in the unique human challenges raised by the tension between the bodily and the mental.

Specifically, following a few years of academic exploration (BSc in Psychology, MSc in Theoretical Psychoanalytic Studies) and gaining experience of providing support in various mental health and other NHS settings as a volunteer, I have decided to focus my education and later on my research activities in neuropsychology. I was particularly interested in the ways of remembering one's life (autobiographical memory and the so called 'narrative self', Gallagher, 2000) was influenced by stroke and other kinds of acquired brain injury. Part of the fascination of these topics was the sheer shock of the effects of amnesia; I will never forget the first time I met a severely amnesic individual. A part of me just could not accept that he was unable to remember meeting me just five minutes ago. I wondered whether he was 'pulling my leg' for some reason and I remember distinctively how at the same time I revolted (silently) against his relatives' similar doubtful attitude. Why is it, I wondered, that it is so hard for us not to attribute one's psychological attitude to anything else other than his or her agency or will? Why is our intuition telling us that it cannot be 'just his brain's fault'? These kind of thoughts was my intellectual side speaking. Then, there were the more emotional aspects.

I was there to observe a 'simple' memory assessment, conducted by an experienced and positively predisposed clinical psychologist, yet after a while my whole body wanted to scream about all of the complex feelings and paradoxes that were been played right in front of me, without a single 'professional' word, or gesture. I remember that I had fought back the tears at this session, while the patient's wife and his brother were unable too, the patient himself was very angry and seam utterly lost by the end of the session. The psychologist was sympathetic

and kind, yet at the same time, it was evident that her job was to describe the nature of the memory deficit itself, not deal with any wider psychological or social consequences. I had this strong sense of 'incompleteness'. In hindsight, I know that part of this sense was my own, more habitual tendency to struggle with my (at times) inevitable, impotence to solve all sorts of hardships in other people. Back then, as an aspiring MSc graduate, I had not figured that bit out. It did however become apparent to me, early on, that a more 'emotional' neuropsychological research could play a more clinically-useful role to play.

For example, my Master's thesis concerned the careful and systematic description of lengthy clinical interviews with an individual (single case study methodology) with confabulation, i.e. the unintentional production of false memories following brain damage resulting from the surgical removal of a brain tumour (Fotopoulou et al., 2004). Under the influence of my supervisor, a psychoanalyst and a neuropsychologist, it quickly became evident to me that the individual's false memories were not mere, random, side-effects of his brain lesion but instead were closely related to his perception of himself, others, and related feelings, prior to and following his stroke. This had been the focus of my first research-based doctorate (PhD, awarded 2005 University of Durham) in which I used experimental methodologies and single-case, qualitative approaches to study the role of personal motivation and emotion in the striking neuropsychological symptoms of (a) severe amnesia for the personal past, (b) confabulation (spontaneous and unintentional production of false memories) (Fotopoulou et al., 2007a; b; Fotopoulou, 2008).

I have, since then, not only decided to train as a Counselling Psychologist, but also focused my research interests and postdoctoral research efforts on understanding and systematically studying how the subjective experience of one's own body is affected following brain damage. Inspired by my studies as part of the Doctorate in Psychotherapeutic and Counselling Psychology, I have also actively participated in the psychotherapeutic treatment of many of these patients, under the supervision of clinical or, counselling psychologists, as a volunteer and later on as part of some of my clinical placements for the course. The counter-intuitive neuropsychological symptoms I have encountered during such research and clinical

placements have traditionally been characterised as ‘mere’ and ‘direct’ consequences of brain damage. Yet, my clinical experience and my initial studies suggested that in several circumstances, patients’ symptoms were closely related to what they themselves considered core aspects of their ‘self, i.e. their everyday, habitual experience of their own body and agency in the world, their personal identity, bodily integrity and personality. Patients may say for example, ‘but I have always founded difficult to trust others. I am not sure I can believe what the doctors are saying, when I feel fine myself’. Or, patients have been calm and seemingly not worried for days, may suddenly get profoundly irritated and angry with others about a minor inconvenience, such as misplacing their spectacles. For example, a person that has been quiet in the ward for days, suddenly screamed at their carers that it is ‘Impossible to live without my spectacles. Don’t you understand? I will not be able to do anything, go anywhere. What have you done with my spectacles? There goes my independence, gone, gone, gone. Nobody cares, nobody understands’.

These experiences led me to wonder how can we best study and understand such behaviours and feelings given the existing polarisation between the fields? What could quantitative methods and brain scans tell us about these patients’ personal experience and history? Their sense of agency? And is it legitimate to just ignore these aspects of their lived experience because they have recently suffered a stroke, which presumably is causing some of their cognitive difficulties? Reversely, what could qualitative interviews tell us about these patients’ brain and the relation between their stroke and their current feelings or experiences? And if not much, is it legitimate to ignore their brain damage?

In trying to answer such questions, I quickly realise one cannot easily avoid confronting the rigid epistemological dualism between mind and body, as often is implied in the neurocognitive explanations of these symptoms (see previous Chapter) and only recently challenged by emerging interdisciplinary fields such as neuropsychiatry and neurophilosophy. My formal training in Existential, Phenomenological Counselling and Psychotherapeutic Psychology was indeed motivated by precisely such challenges and questions, including not only as regards epistemology in relation to disorders but also my effectiveness as a researcher and a clinician. Specifically, Woolfe, Dryden, and Strawbridge (2003) in their Handbook of Counselling Psychology have emphasised the field’s commitment to balancing the roles of clinician and researcher, a professional identity frequently summarised in the UK under the term science-practitioner identity (SPI). This marriage of roles is based on a growing realisation

within the field that a dialogue between empirical psychology and psychotherapy would be beneficial ('Professional Practice Guidelines' of the British Psychological Society, 2001).

However, as this marriage entails partners of different epistemological traditions, a certain tension is unavoidable. I will refer here particularly to the tension between existential/phenomenological approaches to both research and the practice of psychology and the positivistic and psychometric methodologies of mainstream, empirical psychology and neuroscience. Existentialism has situated human consciousness in the world, giving rise to concepts of embedded and inter-subjective experience and has thus bridged the gap between knowing the world and experiencing the world. Contradicting positivistic ideas regarding knowledge and truth, existentialism suggests that the acquisition of knowledge is the consequence of an active participation with the world and people in it - not the product of disengaged research. Given the grounding of counselling psychology in the traditions of humanism, it is not alien to such epistemological proposals. Although the traditions of existentialism and humanism are not identical, both allow counselling psychology to seek to unite rigorous scientific enquiry and a firm belief in the primacy of the therapeutic relation. Furthermore, the rigorous project and method of existential/phenomenological perspectives (i.e. the phenomenological method) and its devotion to the notions of intentionality and subjective construction of meaning can provide a unique epistemological stance for the counselling psychologist, in principle, even in the case of brain damage. Such a stance, which relies on description and focus on the exploration of phenomena as they disclose themselves to us, is inherent in phenomenological traditions. It can further allow investigators, or science-practitioners, to both be aware of, and reflect on their own contribution to the phenomena encountered in therapy or in research with people with brain damage. This can, in turn, allow them to better understand the requirement of 'bracketing out' pre-established knowledge and rediscovering experience of brain-damage together with their clients and research 'co-participants'.

Yet, as outlined above, part of my training has been in studying psychological phenomena that utilise quantitative research methods. These epistemological studies rely on empiricism and the logico-positivistic tradition within philosophy leading research in psychology, to be primarily influenced by the methodological rigour of natural science, namely the establishment of 'objective' knowledge on occurring phenomena, stripped of any subjective influences or other factors that relate to the context in which phenomena occur. More recently,

a strong trend within research psychology dictates that psychological phenomena are not even explained in their own right, but instead they are referred to some other level of analysis, usually the biological or neural levels, and thus explained away, or reduced to these levels. To give an extreme but sadly not rare example, the experience of being in love is not explored in the context of a person's previous and current life circumstances, his or her longings and fears but rather it is considered as a direct consequence of an increase of dopamine levels in one's ventral striatum (Aron et al., 2005; Fisher et al., 2005).

Although given my first doctorate, I do not lack the scientific or technical expertise to appreciate the principles and advantages of such epistemological reduction, my philosophical reading and my experience as a training counselling psychologist precludes me from concluding that this level of analysis is sufficient for a full understanding of the psychological experience of being in love. By contrast, as a practitioner, I wish to understand this human phenomenon by prioritising the person's subjective experience of the phenomenon, as well as its position within his or her general worldview and life. I wish to explore together with my client the consequences of such an experience and its impact on his or her well-being, as well as form the basis of our ability to share this experience within our therapeutic relation and to use it in our more general attempt to explore the client's life and concerns. In other words, for a counselling psychology practitioner, human experience cannot be reduced to mere indices of a concomitant biological function, or any other similar reduction of the wealth of lived experience and its inter-subjective sharing. As Deurzen-Smith suggests, "in the realm of living exact answers and facts do not have a place: there needs to be room for paradox and contradiction, there needs to be room for integration of opposites and co-existence of multiple versions of a truth" (1990, p. 11).

However, given my SPI, the above critique of established reductionist practices in neuropsychological research raised a number of questions. How then, can the scientist in me summarise knowledge and generalise across individual cases? Also, how can I communicate with my fellow scientists and reliably and persuasively convey something to them about the wealth of human experience even in the face of the most devastating brain injury? Finally, how can I actively participate in, and thus influence the generation of knowledge that takes place in research and that I use as a practitioner (i.e. be a producer as well as user, of knowledge and understanding; Woolfe et al, 2003, p. 6). It is in response to such questions that I believe that interdisciplinary perspectives have an important contribution to make to the study of

neuropsychological phenomena, even if some epistemological and methodological reductionism is accepted and practiced, albeit with critical appraisal (see Discussion Chapter).

More generally, I progressively came to feel that questions about the mind-body relation, the self and consciousness in the context of brain damage, are not easy to answer and certainly not in a single research project. Some of the complexity regarding the mind-body relation, subjectivity and the changes that brain damage may bring would need to be left aside. Given the acute stage of illness, the hospital setting and most importantly the fact that these patients own reflective capacities were compromised (indeed even the above instances of partial awareness were rare), I felt that experimental methods may be a better choice than long, qualitative interviews. In addition, I was conscious of my desire (however deeply rooted in my own issues and misguided it may be) for my research outcomes to be heard by the professionals who work with such patients. I wanted my research to have 'impact' in *that* world, not just in counselling psychology and psychotherapeutic worlds. Somehow I felt I would be preaching to the converter, while also 'neglecting' the medical system that cares for these patients. I feel that quantitative methods and papers published in neuroscientific and medical journals had a better chance of being 'heard' by the doctors and clinical neuropsychologists. Indeed, I wanted this thesis to be able to provide a recognisable and legitimate medium from which to strengthen the position of the counselling psychologists within the field of neuropsychology, and thus inform the current debate between neurosciences and humanities. Lastly, there is a related degree of self-interest that I feel I ought to reveal. The aforementioned impact is beneficial to my career and may allow me greater professional recognition, which I desire. Finally, I admit that I am more familiar with quantitative research methods and hence I felt greater confidence in 'probing' such complex phenomena with familiar than unfamiliar ways. By contrast, I feel quite insecure about philosophy and its complexities and given all the work and reading that has gone into philosophical concepts and their intricacies for the purposes of this thesis and my doctorate degree more generally, I did not feel capable, or courageous enough to tackle philosophical complexities and new (to me) methodological challenges in one go and in such a population with known cognitive difficulties and practical limitations (e.g. limited amount of free time and privacy in stroke wards).

2.3. General Methods

The experimental and clinical investigations undertaken in the present thesis will be presented in the following chapters, as pertaining to the specific hypotheses each chapter will address. However, before proceeding to these experimental methodologies, it is necessary to include a separate section that aims to describe the recruitment, classification and testing methods and procedures used throughout the thesis to assess the neuropsychological and neuroanatomical profile of the recruited participants. Accordingly, this chapter provides an overview of the basic methods of the study, common in the subsequent chapters.

2.3.1. Participants

Recruitment Criteria

The study formed part of a wider investigation of action and body awareness following stroke. In the current study, consecutive participants (adults, men and women, of all ethnicities and between 18 and 80 years) were invited to join the study if they fulfilled the following inclusion and exclusion criteria. These inclusion and exclusion criteria are formed based on purposive sampling in terms of neurological and medical homogeneity (i.e. pure, acute cases of stroke-induced anosognosia with discrete lesions seen in a particular hospital ward, and no documented psychiatric history, were recruited; see below for full criteria). However, they are based on random, exploratory sampling in terms of demographic variables. This mixed recruitment strategy is chosen because the aim of the study is to assess how a specific, bodily, medical symptom affects various individuals of possible different backgrounds, personalities and concerns, as these are admitted to standard acute hospital wards in the UK. This sampling thus reflects the specific reality of stroke-induced unawareness of paralysis as found in UK hospitals.

Inclusion Criteria were (1) a medical diagnosis of a recent stroke (less than 4 months post-onset); (2) unilateral right hemisphere lesions (as detected by CT or MRI neuroimaging investigations); (3) Berti et al (1996) have suggested that studying cases with denial of complete contralateral hemiplegia can generate more reliable findings than investigating patients with mild or moderate hemiparesis. Accordingly, a critical criterion of contralateral hemiplegia was used and (4) disturbance in action awareness (anosognosia for hemiplegia, AHP), or in somatic ownership (DSO), as determined by related questionnaires (see below for details). Exclusion criteria were: (1) previous documented neurological or psychiatric history;

(2) less than seven years of education or an estimated pre-morbid Full Scale Intelligence Quotient (FSIQ) based on the Wechsler Test of Adult Reading (WTAR, Wechsler, 2001; see also below) less than 70; (3) medication with severe cognitive or mood side effects; (5) severe language impairment (i.e. insufficient communication). Control participants also fulfilled the above inclusion and exclusion criteria with the exception of inclusion criterion (1).

Classification Assessments and Criteria

Patients were classified as having AHP using two assessment measures: The Berti interview (Berti et al., 1996) and the Feinberg Scale (Feinberg, Roane & Ali, 2000) (see Appendix I). The Berti interview was the basis of the classification of patients with AHP, and the Feinberg analysis used to specific the severity of the anosognosia.

The Berti interview

Classification was firstly based on the Berti verbal awareness interview (Berti et al., 1996). The interview began with general questions (e.g. 'Why are you in the hospital?'), then followed by specific questions regarding motor ability (e.g. 'Can you move your left arm?'), and 'confrontation' questions (e.g. 'Please touch my hand with your left hand. Have you done it?'). The structured interview is scored on a three-point scale: 2 = denial of motor impairment and failure to reach the examiners hand (severe anosognosia); 1 = denial of motor impairment, but admits to failure to reach examiner hand (mild anosognosia); and 0 = full acknowledgment of motor deficits (normal). Patients scoring one or two categorised as anosognosic.

The Feinberg Awareness scale

The Feinberg et al. (2000) scale was used as a secondary measure of unawareness to rate the severity of the anosognosia. The scale consists of 10-items. Questions begin with general self-report items (e.g. 'Do you have any weakness anywhere?'), followed by emotion related items (e.g., 'Are you fearful about losing your ability to use your arm?') and items from a third-person perspective (e.g., 'The doctors tell me that there is some paralysis in your arm. Do you agree?'). The questions conclude with task-related and 'confrontation' items (e.g. 'Please try and move your left arm for me. Did you move it?'). Responses were scored by the examiner for each item: 0 = complete awareness; 0.5 = partial unawareness; and 1 = complete unawareness. The responses are summed to produce a composite 'Feinberg awareness score': 0 = complete awareness, 10 = complete unawareness.

Patients were classified as having disturbances of left arm ownership based on adjusted versions of the Feinberg (et al., 1990) assessment of verbal asomatognosia and somatoparaphrenia, administered as follows: Jewellery, watches and identifiable tags were removed from participants' arms where possible. Following permission, the patient's left arm is lifted gently by the elbow, moved and placed in front of the patient in his right hemispace. The examiner's arm is returned to the patient's left hemispace. The patient's attention is distracted momentarily, and then the examiner points to the patients left arm and asks 'is this your arm?' Responses are noted verbatim and scored by the examiner for each item as: 0 = normal ownership; and 1 = asomatognosia, or more generally DSO. Two further questions were asked in the current study to specifically test the potential arm ownership attribution to other people, namely 'Does it ever feel like your left arm does not belong to you? If the patient answered affirmatively then they were asked, 'Does it feel like it may belong to someone else? Who?' Responses are noted verbatim and scored by the examiner for each item as: 0 = normal ownership; and 1 = somatoparaphrenia. A score of one, or above in the first set of questions indicated asomatognosia. A score of one, or above in the second set of questions indicated somatoparaphrenia.

Final Sample

The total number of patients screened was 22. Five patients were excluded because they did not meet the above criteria. Three patients were consented and recruited, but were unable to participate in study due to medical complications, severe fatigue, hospital transfer or death. Thus, in total 14 patients participated in the study. Of these seven patients had AHP, one patient had both AHP and DSO, while seven patients were HP control participants, as determined by the performance in the measures described below. The number of patients contributing to each individual experiment, as well as demographic and clinical characteristics, are detailed in each chapter separately.

2.3.2. Ethical Approvals and Considerations

This section reviews the general Ethical approvals and considerations involved in this research. Wider ethical issues arising during the research and related reflections and challenges are discussed in the Discussion section. Ethical approval for this research has been sought of and granted by the local NHS trust, as part of a wider research project on unawareness of illness following brain damage pursued by the author and her clinical supervisors at the

stroke ward involved. The study has also been ethically considered and approved by Middlesex University. The author has also received clear guidance and support regarding ethical considerations from clinicians at the Institute of Psychiatry and St. Thomas's hospital where she had been based as a psychological researcher from 2005 to 2013. The author has previously been awarded ethical approval for many behavioural, neuroimaging and neuropsychological studies, including various studies on stroke patients. Thus, the applicant is fully aware of the ethical issues involved in her research and she has gained experience in establishing and maintaining high levels of ethical practice in clinical research. This experience has informed the ethical considerations of the current project.

All research activities have been performed according to the Helsinki Declaration and international Good Research and Clinical Practice guidelines and requirements were fulfilled. These included the following considerations: Patients were asked to reveal some personal information and audio-recordings were made to document patients' subjective experience of their abilities, and their behaviour in relation to their paralysed limps. Patients' written informed consent and permission was obtained for all research and educational uses of these records (see below for procedures). A copy of the Information Sheet and the signed consent form was given to all participants and was also be given to the clinician responsible for their care. Participants were encouraged to ask questions about the study before consenting. The confidentiality and anonymity of the collected data was protected: Participants' personal identification information was removed from all protocols. Access to all research records was granted only to the investigator, with the aid of password-protected electronic files, anonymization coding and locked file-cabinets. All raw data will be destroyed 3 years after completion of the study, following NHS guidelines. Anonymous and quantified data will be retained for 5 years following their publication (standard publication practice). The only potential risk associated with the research involved participants experiencing mental fatigue or distress while tested. Consecutive testing sessions were arranged that were appropriate in duration to each patient's ability. Participants were offered feedback at the end of the study, should they wished to receive it, and they were offered to call the examiner should they wish to discuss any topics of the interview further. Referral to the psychologists working at the ward was be possible, should the participant had requested it, or the examiner felt the participant was experiencing severe distress as a result of the study, or irrespective of the study, as a result of their post-stroke condition. There are no direct benefits to the participants, although they may

have enjoyed participating and several have given such feedback (see individual chapters below).

2.3.3. General Recruitment, Consent and Testing Procedures

Potentially eligible participants were approached under the guidance of the clinical team. After the purpose of the study was explained to each of the participants, they were asked if they wished to participate in the study. They were informed that their participation is entirely voluntary and that they can withdraw from the study at any time, without consequences and without giving a reason. It was emphasized, that the participants did not have to make a decision immediately and that they could do so within a 48-hour period. If a potential participant expressed an interest to participate, the researcher carefully read through the information sheet and consent forms, at the pace appropriate for each of the participants. The participants were encouraged to ask questions and discuss the study. If the participant agreed to take part in the study, eligibility was confirmed and they were asked to sign and date the consent form. A copy of the Information Sheet and Consent form is in Appendix II.

Stroke patients were all tested by the bedside, in as quiet conditions as possible. The number and time of testing sessions varied between patients, depending on their hospital care schedule, willingness and medical state. Testing took between three to eight sessions to complete, with each session lasting a maximum of one hour. When possible, shorter testing sessions were performed on sequential days to minimize fatigue.

2.3.4. Neurological and Neuropsychological Assessment

All patients underwent formal neurological assessment. Clinical and demographic information were collected from medical notes, patients and their relatives. Their neuropsychological profile was assessed using standardized tests, as follows:

Neurological Assessment: Motor strength of the upper and lower limbs was assessed using the Medical Research Council scale (MRC; Guarantors of Brain, 1986). The MRC scale grades motor power on an ordinal scale: 0 = no contraction; 1 = flicker or trace of contraction; 2 = action movement, with gravity eliminated; 3 = active movement against gravity; 4 = active movement against gravity and resistance; 5 = normal power. Three subtests of the Rivermead Assessment of Somatosensory Performance (RASP; Winward et al., 2002) were used for the measurement of sensory functions: ‘Surface Touch’, ‘Tactile Extinction’ and ‘Proprioception’.

The customary 'confrontation' technique was administered to test visual fields and tactile extinction (Bisiach et al., 1986). Left-right disorientation was assessed clinically, by asking patients to judge the side of their own and the examiner's body parts, as well as of objects presented in peripersonal and extrapersonal space.

Premorbid Intelligence: The standardized Wechsler Test of Adult Reading (Wechsler, 2001) was used to provide an estimate of premorbid intellectual function, taking into account norms of education and age. The test consists of a list of 50, phonetically irregular words. Participants are asked to read aloud a list of words, which are scored for pronunciation errors by the examiner. Correct performance relies on prior knowledge given that the correct pronunciation of the words cannot be deduced from their spelling.

General Cognitive Functioning: Working memory was assessed using the digit span task, forwards and backwards, from the Wechsler Adult Intelligence Scale III (WAIS III; Wechsler, 1998) and certain other verbal and visuospatial tests from this battery (Vocabulary, Similarities, Arithmetic and Matrix Reasoning) were used when possible to asses more general aspects of postmorbid intelligence as needed (see Chapters, 3, 4 and 5 for details).

Extrapersonal Neglect: The Behavioural Inattention Test (BIT; Wilson, Cockborn & Halligan, 1987) is a standardised test used to assess unilateral visual-spatial neglect commonly occurring after right-hemisphere damage. Five of the conventional subtests from the BIT were administered: line crossing, star cancellation, copy, representational drawing and line bisection. Each subtest was scored individually according to the BIT standardized procedures.

Personal Neglect. Personal neglect was tested by the 'one item test' (Bisiach, Vallar, Perani, Papani & Berti, 1986), and the 'comb/razor' test (McIntoch et al., 2000). In the 'one item test' the patient is asked to use their right, ipsilateral hand to reach to their left, contralateral arm. The patients' attempts are rated on a three-point scale: 0 = good; 1 = done but with small error, uncertainty or latency; 2 = the search is interrupted before the search is completed; and 3 = no movement towards the other hand is performed. In the Comb and Razor Test the patient is given an object like a pen and is asked to pretend performing certain everyday bodily care activities such as using a comb or a razor. The %bias of the total score is calculated using the following formula: *%bias = (left - right strokes) / (left+right+ambigous strokes)*. The %bias formula yields a score between -1 (total left neglect) and +1 (total right neglect). The cut off for left personal neglect is % bias < -0.11.

Executive Functions. Reasoning abilities were assessed using the Cognitive Estimates Test (Shallice and Evans, 1978) and the Proverbs subtest of the Delis-Kaplan Executive Function System (DK-EFS) (Delis, Kaplan & Kramer, 2001). Inhibition of automatic responses was assessed with the Hayling Test (Burgess & Shallice, 1997; see Chapter 3 for detailed description).

Mood. The Hospital Depression and Anxiety Scale (HADS; Zigmond & Snaith, 1983), was used to assess depression and anxiety. This is a self-rating scale is designed to be used with patients with physical difficulties, so that symptoms such as fatigue do not lead to false positive responses. A total raw score of eight to ten is considered borderline and scores above ten are indicative of the presence of clinical depression and/or anxiety, based on norms from the general population.

In summary, this chapter described the epistemological and methodological context and background of the present thesis, with the intrinsic tensions and difficult choices involved in the interdisciplinary methodology chosen. Subsequently, it presented the general methods applied in this study to recruit, classify and neuropsychologically assess patients with right hemisphere stroke, as well as the characteristics of the ethical considerations of the present study. In the subsequent chapters, the specific neuropsychological profile of the featured participants will be presented in parallel to their performance in experimental tasks and their required, separate methodologies.

3. Tacit Awareness in Anosognosia for Hemiplegia: Interference without Conscious Representation

3.1. Summary

Merleau-Ponty argued that anosognosia for hemiplegia is a pathology whose characteristics offer a unique nature of insight into the character of two, deeply intertwined aspects of our embodied awareness of the world, namely the prereflective, habitual body and its potential for action and the reflective, conscious perception of the world, and the body in it, as a thing in itself. This chapter reviews the cognitive literature on the matter and offers a novel investigation of Merleau-Ponty's hypothesis that patients with AHP have a tacit awareness of their deficits, despite their conscious unawareness. Indeed, patients with anosognosia for hemiplegia, i.e. apparent unawareness of hemiplegia, have been clinically observed to show 'tacit' or 'implicit' awareness of their deficits since the first descriptions of the symptom, but there have been no conclusive, systematic empirical studies. Here, I have experimentally examined whether implicit and explicit responses to the same deficit-related material can dissociate behaviourally. Fourteen stroke patients with right hemisphere lesions and contralesional paralysis were tested for implicit and explicit responses to brief sentences with deficit-related themes. These responses were elicited using: (a) a verbal inhibition test in which patients had to inhibit completing each sentence with an automatic response (implicit task) and (b) a rating procedure in which patients rated the self-relevance of the same sentences (explicit task). A group of anosognosic hemiplegic patients was significantly slower than a control group of aware hemiplegic patients in performing the inhibition task with deficit-related sentences than with other emotionally-negative themes (relative to neutral themes). This occurred despite their explicit denial of the self-relevance of the former sentences. Individual patient analysis showed that six of the seven anosognosic patients significantly differed from the control group in this dissociation. By lesion mapping procedures, I found that the lesions of the anosognosic patients differed from those of the 'aware' controls mainly by involving the anterior parts of the insula, inferior motor areas, basal ganglia structures, limbic structures and deep white matter. By contrast the anosognosic patient without implicit awareness had more cortical

lesions, mostly in frontal areas, including lateral premotor regions, and also in the parietal and occipital lobes. These results provide strong experimental support for tacit awareness in AHP, confirming Merleau-Ponty's intuitions and are thus discussed in this light.

3.2. Introduction

3.2.1. The Paradox of Tacit Awareness in Merleau-Ponty

As outlined in the introduction, some patients with central neurological damage are apparently unable to acknowledge their contralesional motor deficits. This rare neuropsychological symptom, which is the focus of this thesis, has been long termed anosognosia for hemiplegia (AHP) – a term implying lack of *knowledge* of the deficit (Babinski, 1914; see also Jenkinson & Fotopoulou, 2014). As mentioned in the introduction, contrary to the mainstream neurology of his time, Merleau-Ponty (1945/1962) argues that such clinical phenomena (he considers anosognosia in parallel to the phenomenon of phantom limb which I will not focus upon in this thesis) are not to be understood as difficulties in the domain of explicit, reflective knowledge. Instead, such phenomena reveal the pre-reflective nature of our bodily experience and its structuring influence in all our perception. According to him, AHP is best understood from the point of view of "the perspective of being-in-the-world" as put forward to in his own, early seminal work on embodiment and consciousness (Merleau-Ponty, 1945/1962, p. 94).

More specifically, Merleau-Ponty introduces the concept of 'sch**é**ma corporel' (Merleau-Ponty, 1945/1962, p. 113), unfortunately translated in English as 'body image' (see Gallagher, 1995 for an analysis of the relationship between the concepts of 'body schema' and 'body image' across and within fields), to argue in favour of a non-representational, pre-reflective and tacit sense in which the body and its functional laws (rather than its image- or language-like content: 1945/1962: 99-101) acts as the perceiver of experience, and not its object. Contrary to Husserl's transcendental analysis, according to which everything of importance happens in full transcendental view, lying ahead of the noetic act as it were, Merleau-Ponty's early work emphasises the starting point of the act of perception, rather than its 'objects'. The physical body structures all perception. However, that is not to be understood as the 'object' of consciousness or perception. The body functions based on a tacit, pragmatic knowledge it has of the world and itself in it, prior to any cognitive experience, reflection or,

representation. The physical body and its potential for action on the world (the schéma corporel) deliver to consciousness meanings already formed by the very encounter between body and world. For example, the world habitually appears only partially to the subject and in an egocentric perspective (determined by the shape of the body and the position of our sensory organs), while different objects call for different usages (e.g. grasping versus reaching). Thus, the body and the world place conditions upon perception in an automated way and at a behavioural, subpersonal level. According to Merleau-Ponty it is precisely because of this prereflective nature of the fundamental aspects of bodily awareness that renders the schéma corporel a suitable object for interdisciplinary considerations by empirical studies, and particularly empirical studies on topics like anosognosia.

Indeed, Merleau-Ponty argues that while anosognosia calls for both psychological and physiological explanations, none seems satisfactory. Specifically, he refers to some of the clinical descriptions of anosognosic patients, as presented by his contemporaries and argues that the experience of patients who systematically ignore their paralysed arm and may even refer to it as 'a long, cold snake' (1945/1962; p. 88), cannot be explained with pure reference to their sensory deficits. As I mentioned in the introduction, the suggestion that the delusional features of AHP and DSO cannot be fully explained by pure sensorimotor accounts is a point of view commonly held and discussed to date. Merleau-Ponty however also rules out the possibility that anosognosia can be explained as a psychological memory, volition, or a belief, given that certain biological events may alter the nature of the patient's experience and delusions (e.g. he refers mainly to phantom limb and the fact that the severance of nerves to the brain abolishes the experience of phantom limbs). The key to explaining anosognosia (and phantom limbs and related phenomena) therefore is also the key to explain how the psychological factors in question and the physiological basis of anosognosia "gear into each other" (1945/1962; p. 89). How can the neglect of the paralysed limb, Merleau-Ponty asks, if dependent on the present neural deficits and therefore a causality independent of the subject, arise also out of the personal history of the patient, his memories, emotions and volitions?

The answer Merleau-Ponty claims is in the notions summarized as the schéma corporel and his version of the existential notion of 'being-in-the-world'. To say that one exists in a world, that one has a world or that one belongs to a world is not to say that one has an objective

consciousness of that world and itself in it. The anchoring of one to the world is instead primarily a bodily anchoring with practical significance and an open-endedness of purpose. Our bodily reflexes and our capacities for sensory perception are indeed just that, for Merleau-Ponty, a priori capacities and possibilities. Before the appreciation and categorization of experience into stimuli or, concepts, our body carries energy and a practical potential in relation to the world that shapes the organization of experience. Our physical embodiment, in contrast to our personal and historical trajectory on which we have knowledge, is one of biological regularity, such as bodily rhythms and other biological constraints that the person has had little choice in or knowledge of. In Merleau-Ponty's words, around our personal existence, there seems to be "a margin of almost impersonal existence, which can be practically taken for granted" (1945/1962; p. 96).

It is this sub-personal and pre-reflective dimension of the body, a frontiers concept between the psychological and the physiological that can explain how the paralysis is both present and absent for the patient. Presence and absence, Merleau-Ponty claims are indeed categories of the objective world that are unhelpful in this case and we need to surpass them in our attempts to understand the experience of the anosognosic patient and by extension the 'being-in-the-world'. He writes, *" In reality the anosognosic is not simply ignorant of the existence of his paralysed limb: he can evade his deficiency only because he knows where he risks encountering it…We do not understand the absence or death of a friend until the time comes when we expect a reply from him and when we realize that we shall never again receive one; so at first we avoid asking in order not to have to notice this silence; we turn aside from those areas of our life in which we might meet this nothingness, but this very fact necessitates that we intuit them. In the same way the anosognosic leaves his paralysed arm out of account in order not to have to feel his handicap, but this means that he has a preconscious knowledge of it"* (1945/1962; p. 93).

The above passage should not be understood as though patients with AHP consciously decide, or intend to deceive others, or indeed themselves regarding their paralysis (see Hirstein, 2005 for an analysis of anosognosia in relation to contemporary notions of self-deception). There can be no such conscious intention, or decision regarding the denial of paralysis, as their conscious appreciation of their body does not include the habitual intuition of the body as one

of practical potentiality. And yet according to Merleau-Ponty, it is precisely this paradox between practically evading one's disability and yet being consciously ignorant of it that best reveals the nature of our embodied, impersonal existence in the world. The paradox of anosognosia is the paradox of a perceptual world that is shaped by my own embodied and active relation to it before it is actually perceived by me as perceptible. Or in other terms, the paradox of anosognosia reveals the nature of perception or consciousness itself as a (potentially distorting) first-person derivative of my very need to perceive, or be conscious of a world beyond the here-and-now of practical, embodied, egocentric experience. As Merleau-Ponty powerfully explains the anosognosic patient finds evidence of his 'intact' motor abilities in the very objects that reveal his disability. A bicycle, a knife or a chair elicit a set of action potentialities, in the same time as they reveal that these actions cannot be performed. Utilizable objects, precisely in so far as they perceived as utilizable, appeal to the patient's arm in ways that he can no longer utilize. This analysis highlights that the felt body indeed comprises of at least two aspects, the conscious, reflective body in the moment and the habitual body (the body corporel). The paradox of anosognosia reveals therefore that an object appears as utilizable even if it is so in the habitual sense only but not in the here-and-now. But how can we then perceive objects that we cannot manipulate as actually manipulatable? The answer argues Merleau-Ponty lies in the fact that *"The manipulatable must have ceased to be what I am now manipulating, and become what one can manipulate; it must have ceased to be a thing manipulatable for me and become a thing manipulatable in itself. Correspondingly, my body must be apprehended not only in an experience which is instantaneous, peculiar to itself and complete in itself, but also in some general aspect and in the light of an impersonal being".* (1945/1962; p. 95).

Thus, in everyday life, the objects and stimuli of the world appear to my consciousness as separate than my practical intentions and habits on which their existence for me actually depends. In other terms they appear to conscious perception as though they exist prior and independently of my embodiment. As Merleau-Ponty notes in the above quote, the same of course applies to the very body itself; in this sense of consciousness, my own body appears to me as *a thing in itself*, perceived in the fashion of objects, as if it could be perceived in its own totality (as a thing in itself), not by the totality of my embodied and practical being but by any one body, position or point in time (this point leads on to a wider discussion on 'otherness' and

intersubjectivity that I cannot do justice to in this thesis but I do briefly refer to in relation to some specific findings on anosognosia in Chapters 5, 6 and 7).

In relation to the explanation of AHP per se, Merleau-Ponty argues that the syndrome is indeed best explained by his account of the nature of the 'being-in-the-world that can cut across the physical and the mental levels of explanation. Specifically, according to Merleau-Ponty it is the patient's more general commitment to the world as the body itself 'knows' it tacitly, habitually and practically, rather than in a reflective, conscious manner, that drives one to deny one's paralysis in the here-and-now and the more abstract, reflective consciousness of the body as a *thing in itself*. The later more 'objective' dimension of awareness needs to be sacrificed due to the natural momentum of being-in-the-world that necessitates us to remain tacitly open all our habitual possibilities. Thus, in following Merleau-Ponty' s thinking, I conclude that patients with AHP continue to perceive their body in the totality of their embodied and practical being, but no longer perceive it correctly as in the fashion of objects, as it could be perceived by any one body, any one spatial position or point in time, or in other terms 'objectively'. Moreover, given this explanation it follows that an investigation of anosognosia at the level of the contents of consciousness alone, be this a positivistic or a phenomenological enquiry, may always miss the tacit and pre-reflective nature of this commitment to the world. Below I will undertake a reductionist investigation in patients with AHP, with the sole of aim of examining whether any empirical evidence of the presence of tacit awareness of paralysis can be observed in patients with AHP, despite their conscious unawareness. I will then relate the findings to a more general theoretical analysis, motivated and constrained by the existential-phenomenological perspective put forward my Merleau-Ponty as briefly outlined here.

3.2.2. The Paradox of Tacit Awareness in the Neurocognitive Literature

The above reflections on AHP raise the question of whether any behavioural or other studies have been able to provide any indications of the possible role of such tacit, implicit body awareness in AHP and related symptoms of body unawareness. Indeed, this facet of AHP has been commented upon by clinicians since the time of Babinski (see Jenkinson & Fotopoulou, 2014 for historical references) but remains a poorly investigated distinction in the cognitive neuropsychology of AHP. Contemporary, anecdotal accounts have continued to note that some patients with AHP show indications of 'tacit' or 'implicit' awareness of their deficits,

which in the cognitive literature is defined as "knowledge that is expressed in task performance unintentionally and with little or no phenomenal awareness" (Schacter, 1990, p. 157). Thus, while patients may explicitly deny their paralysis, they may be unconsciously processing some components of their deficits, including the emotional aspects. For example, a severely anosognosic patient who persistently denied her paralysis and all associated disabilities, spontaneously told junior doctors during a ward round: "Perhaps it would be really useful to you to come and see me at a time when I'll be really ill and unable to move" (see Chapter 5). Another AHP patient who was explicitly denying her paralysis, unceasingly complained about everyday difficulties with an emotional intensity that better fitted her devastating disability than these minor everyday disappointments (Fotopoulou & Conway, 2004). However, beyond the level of single cases or case series (e.g. Ramachandran, 1995; Berti et al., 1998; Nardone et al., 2007), this issue had not been systematically explored in AHP until recently. By contrast, the unconscious processing of cognitive and emotional information has been experimentally investigated and confirmed in other neuropsychological syndromes, including hemispatial neglect (Marshall & Halligan, 1988), blindsight (Weiskrantz et al., 1974), prosopagnosia (Tranel & Damasio, 1985) and amnesia (Johnson et al., 1985).

In a recent group study, Cocchini and colleagues (2010) showed that patients' behaviour did not always reflect their explicit estimations of their own abilities in a self-report questionnaire. Specifically, two patients approached a series of bi-manual tasks as if they could use both hands but did not show unawareness in a self-report measure, while another eight patients showed the opposite result. The authors interpreted their findings as a double dissociation between explicit and implicit awareness for motor deficits. However, this study used two different and unrelated tests to measure the two forms of unawareness. This raises the possibility that the two tasks were distinct in some components or items (for example their attentional or memory demands), posing differing challenges for reasons other than variability in response explicitness.

To conclude reliably that implicit and explicit awareness dissociate within a single patient or across groups, implicit versus explicit modes of responding need to be assessed using identical, or well-controlled and balanced, material presented in the same modality. In addition, the material should be compared with other material of similar emotional value, to control for the potential role of negative emotions associated with one's deficits. Finally, independent confirmation of 'unawareness' by tests used in previous studies would provide additional

validity to the measures used to establish unawareness for hemiplegia. To my knowledge, such comparisons have not yet been undertaken in the study of AHP.

Taking all this into consideration, the current study aimed to compare directly the explicit and implicit processing of the same, emotionally 'controlled', experimental material. To this end, I employed a verbal inhibition test (based on a standardised verbal equivalent of the Stroop procedure; see Discussion for a detailed consideration of similarities and differences) and examined whether patients with AHP were slower in performing the inhibition task when the material of the test included deficit-related information than when it included other negative or neutral themes. Typically, selective slowing of responses in emotional Stroop-like tests is thought to reflect 'unconscious' response competition between the processing of emotional self-threatening information and the requirement to complete the task (e.g., Wentura et al., 2000). In our study, such selective slowing would suggest that, although patients with AHP show poor explicit awareness of their hemiplegia, they may be implicitly aware of it and hence behave accordingly when confronted with paralysis-related material. Importantly, our task allows the direct comparison of explicit and implicit processing of the same verbal experimental material by each patient, and controls for the role of negative emotions.

Furthermore, by lesion mapping procedures, this study aimed to investigate the neural correlates of unawareness. As in previous studies of lesion localization in AHP (Ellis & Small, 1997; Berti et al., 2005; Karnath et al., 2005; Baier & Karnath, 2008; see also Pia et al., 2004 for an extensive meta-analysis), I performed lesion comparisons between hemiplegic patients with and without AHP in order to distinguish between the neural correlates of AHP and the parietotemporal network commonly associated with spatial neglect and other common symptoms of right-hemisphere damage. Importantly, previous lesion localisation studies have not taken into account the behavioural dissociation between implicit and explicit awareness, and thus our study aimed to specify previous findings based on such investigations.

3.3. Materials and Methods

3.3.1. Subjects

Fourteen adult neurological patients were consecutively recruited from an acute rehabilitation stroke unit, according to the inclusion and exclusion criteria described in Chapter 2. Patients were classified as having AHP as explained in Chapter 2. The study included seven

right hemisphere damaged patients with complete left arm hemiplegia and AHP (AHP = experimental group) and seven right hemisphere damaged patients with complete left arm hemiplegia but without AHP (HP= control group). Only one patient (AHP5) showed somatoparaphrenia (she believed her left arm was her husband's). There were no indications of disturbed sense of limb ownership (Baier & Karnath, 2008) in any of the other patients. All participants gave written informed consent according to the Declaration of Helsinki and the study was approved by the local Trust's Ethical Committee (see Chapter 2).

3.3.2. Neuropsychological Assessment

In addition to the anosognosia tests mentioned above, all patients were assessed using the standardised tests outlined in Chapter 2, with the addition of the Rosenberg self-esteem scale (Rosenberg, 1965), which was used to measure self-esteem (range 0-30; 15-25 = normal range; < 15 = low self-esteem). Patients' demographic characteristics and their performance on the aforementioned neuropsychological tests are summarised on Table 3.1.

Table 3.1. Groups demographic characteristics and neuropsychological profile

	AHP (N = 7)		**HP controls (N = 7)**		**t-test**		
	Mean	**SD**	**Mean**	**SD**	***t***	***df***	***p***
Age in yrs	64.00	6.06	56.86	18.52	0.97	7.27	0.36
Education in yrs	10.57	3.10	12.29	2.50	0.96	12	0.36
Days from Onset	18.71	19.63	21.29	8.40	0.32	8.13	0.76
Premorbid IQ– WTAR¶	102.60	16.59	105.50	6.60	0.37	5.05	0.73
Berti Awareness¶ LUL	1.43	0.53	0.00	0.00	7.07	6	0.01*
Berti Awareness¶ LLL	1.86	0.38	0.14	0.38	7.07	6	0.01*
AHP Questionnaire¶	5.64	1.38	0.93	0.84	7.74	12	0.01*
WAIS – III¶ Vocabulary	8.14	3.89	9.00	2.92	0.41	10	0.69
WAIS – III Similarities	8.17	3.19	9.17	3.19	0.54	10	0.60
WAIS – III Digit Span	8.86	3.18	10.43	3.55	0.87	12	0.40
WAIS – III Matrix Reasoning	6.00[1]	2.12	6.75[1]	1.50	0.60	7	0.57
WAIS – III Arithmetic	7.00	2.55	9.00	2.00	1.28	7	0.24
Visual Fields¶ R	9.29	0.49	9.86	0.38	2.45	12	0.03*
Visual Fields L	2.71[1]	2.93	5.71[1]	3.30	1.80	12	0.10
Visual Fields Both	1.14[1]	1.68	2.43[1]	2.15	1.25	12	0.24
RASP¶ Surface Touch L - Max 30	6.57[1]	4.80	6.23[1]	3.73	0.13	12	0.90
RASP Surface Touch/Spam Max 10	4.57	2.51	3.86	1.68	0.63	12	0.54
RASP Sensory Extinction - Max 12	4.00	5.22	7.5	3.32	1.11	7	0.30
RASP Proprioception - Max 30 Movement Detection L	6.57[1]	2.64	6.57[1]	4.43	0.00	12	1.00
RASP Proprioception - Max 30 Direction Detection L	4.00[1]	2.31	4.57[1]	4.24	0.31	9.28	0.76
Comb/Razor Test¶ R	27.9	16.0	23.14	3.23	0.77	6.49	0.47
Comb/Razor Test L	9.90	13.60	16.00	6.73	1.07	12	0.31

Comb/Razor Test Ambiguous	7.14	9.35	8.00	5.89	0.21	12	0.84
Comb/Razor Test Bias	0.49[1]	0.39	0.17[1]	0.14	2.11	7.6	0.07*[1]
Bisiach Test¶	0.70	0.50	0.14	0.38	2.45	12	0.03*
BIT¶ Total Score	87.83[1]	30.51	84.00[1]	44.78	0.18	11	0.86
Line Crossing R	18.00	0.00	16.17	3.13	1.44	5	0.21
Line Crossing L	6.50[1]	6.12	13.50[1]	7.15	1.82	10	0.10
Letter Cancellation R	16.17	2.40	14.00	3.74	1.22	11	0.25
Letter Cancellation L	7.67[1]	5.32	10.00[1]	6.73	0.68	11	0.51
Star Cancellation R	22.17	5.98	22.33	5.05	0.05	10	0.96
Star Cancellation L	9.67[1]	11.34	17.83[1]	9.39	1.36	10	0.20
Copy	1.33[1]	1.75	2.71[1]	1.25	1.65	11	0.13
Representational Drawing	1.25	0.96	2.17	1.17	1.30	8	0.23
Line Bisection R	2.43	0.98	2.43	0.98	0.00	12	1.00
Line Bisection Centre	1.57[1]	1.52	2.14	1.46	0.72	12	0.49
Line Bisection L	0.86[1]	1.21	1.57[1]	1.51	0.97	12	0.35
Hayling Test RTs	4.14	1.57	4.29	1.89	0.15	12	0.88
Hayling Test Errors	3.86	1.57	3.00	2.52	0.76	10.07	0.46
Proverbs¶	7.80	2.59	12.00	5.10	1.64	8	0.14
Cognitive Estimates¶	9.29[1]	2.43	8.33[1]	2.25	0.73	11	0.48
HADS¶ Depression	4.57	5.29	7.43	4.31	1.11	12	0.29
HADS¶ Anxiety	8.00	4.43	7.86	5.34	0.05	12	0.96
Self-Esteem	21.57	5.47	20.71	4.61	0.32	12	0.76

[1] Scores below tests' cut-off point, or more than 1 SD below the average mean

*Significant differences between the groups, $p < 0.05$

*[1]Trends towards significance, $p < 0.10$

¶ Berti Awareness = Berti et al. 1996 Awareness Interview; AHP Questionnaire = Feinberg et al. 2000 Awareness Questionnaire. WTAR = Wechsler Test of Adult Reading (Wechsler, 2001); WAIS-III = Wechsler Adult Intelligence Scale - 3rd Edition (Wechsler, 1998); Visual-fields = The customary 'confrontation' technique (Bisiach et al., 1986); BIT Total score = sum of scores of the conventional sub-tests of the Behavioural Inattention Test; 'One Item Test' and 'Comb/Razor Test'= Tests of Personal Neglect. Bias on the latter is calculated according to McIntosh et al., 2000; RASP = The Rivermead Assessment of Somatosensory Performance (Winward, Halligan & Wade, 2002); Proverb Test = Delis Kaplan – Executive Functions System - Proverbs Subtest (Delis, Kaplan & Kramer, 2001); HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); Self Esteem = Rosenberg Self Esteem Scale (1965).

Independent sample *t*-tests revealed that the groups did not differ in age, education, or time since onset at assessment. As expected, the awareness scores of the two groups differed significantly in both interviews used. The two groups did not differ in their general premorbid or current intelligence scores and there were no significant differences in their reasoning and inhibition abilities as measured by three executive tasks. However, both groups performed worse than would be expected on the basis of their premorbid IQ on the WAIS-III Matrix Reasoning subtest and on the Cognitive Estimates Test, suggesting difficulties in both visual and verbal abstract thought and problem-solving. Both groups showed basic left visual and sensory deficits. In addition, both groups showed left visuospatial, sensory and personal

neglect. Interestingly, the latter appeared significantly more severe in the AHP group. The scores of both groups were considered to be within normal limits for a patient population in a general hospital on the HADS, but AHP patients showed lower scores (not statistically significant) for depression and anxiety compared to HP patients. Finally, both groups scored within the normal limits of the general population in the self-esteem measure and there were no differences between them.

3.3.3. Experimental Investigations

Design and Analysis

The study used an inhibition task to study implicit processing of deficit-related material and a rating task to study explicit processing of the same material. The experiment manipulated the effect of Group (AHP patients vs. HP patients) and the effects of Emotional Content (Negative, Neutral and Deficit-related sentences) on explicit ratings of self-relevance and separately on implicit measures of response latency (reaction times, RTs) and the number of suppression errors on a modified inhibition (Stroop-like) task. As in several studies using the Stroop procedure with emotional material (e.g. Charash & McKay, 2002; Kampman et al., 2002), I computed composite measures of interest by subtracting each participant's mean ratings, mean response latencies and mean number of errors for Neutral sentences from their mean ratings, mean response latencies, and mean number of errors for Negative and Deficit-related sentences, respectively. This design allowed for 2 (AHP vs. HP group) x 2 (Negative minus Neutral vs. Deficit-related minus Neutral sentences) comparisons.

In order to explore which and how many of the AHP patients differed significantly from controls in their explicit ratings and implicit responses to deficit-related sentences, the Revised Standardized Difference Test (RSDT) (Crawford et al., 1998; revised in Crawford & Garthwaite, 2005) was used. This is a specialised statistical test developed for comparing the difference between a patient's performance on two tasks with the distribution of differences in controls. It was developed specifically for use in neuropsychological studies with small control samples, and can address the question of whether there is evidence of dissociation between two different tasks in an individual patient.

Materials and Methods

This study employed a modified version of the Hayling Test (Burgess & Shallice, 1997), a standardised test of 'automatic response suppression'. The original test had two sections, both

consisting of 15 sentences that are missing the last word. The critical Section 2 requires the subject to complete the sentence with a word that is completely *unconnected* to the sentence in every way. In other words, this section requires the subject to inhibit an automatic verbal response and to generate a different response which must be completely unrelated to the theme of the sentence. It yields two measures of the ability of the participant to suppress a response (an error score and the time taken to respond). Thus, in summary, this test provides a measure of response suppression which has been shown to be impaired in some patients with frontal lobe lesions (Burgess & Shallice, 1997).

The Emotional Hayling Task

Section 2 of the original Hayling Test was modified to manipulate the emotional theme of the sentences (see Appendix 8.3). The Emotional Hayling Task (EHT) used in the present investigation consisted of 30 sentences that were missing the last word. They varied in theme as follows: (1) 10 sentences related to cars and motoring issues (emotionally neutral sentences hereafter referred to as 'Neutral'); (2) 10 sentences related to violence and physical assault (emotionally negative sentences hereafter referred to as 'Negative'), and (3) 10 sentences related to stroke and motor deficit (emotionally negative sentences specifically related to patients' deficits hereafter referred to as 'Deficit-related'). Other than this emotional theme manipulation, the three sets of sentences were matched for syntactic structure, word count and semantic content as closely as possible. More specifically, the 10 sentences in each category had the exact same syntax and grammatic structure with the corresponding sentences in the other 2 categories as shown in Appendix 8.3 and similarly length of each of the three sentences varied only minimally (a couple of words at most) in all instances (see Appendix 8.3). Example 1: (a) Neutral sentence: 'A tow truck is often used to pull broken-down cars off the…'; (b) Negative sentence 'An ambulance is often used to take assaulted people to the…'; (c) Disability-related sentence: 'A hoist is often used to lift paralysed patients off the…'. Example B: (a) Neutral sentence: 'Some cars can be repaired following motor accidents but others might be left with some permanent mechanical...'; (b) Negative sentence 'Some people recover completely following physical attacks but others might be left with some permanent emotional...'; (c) Disability-related sentence: 'Some people recover completely following brain damage but others might be left with some permanent motor...'.

A pilot study with 23 adults (11 men and 12 women, graduate students with mean age 22.5 years and SD 3.6 years, range 20-33) was conducted to validate the EHT in relation to the original standardised Hayling Test. All subjects completed the original and modified Hayling

Test on separate sessions, in counterbalanced order. There were no gender differences in the performance of either test. Furthermore, the reaction times and errors in both men and women were never greater than two standard deviations from the mean of each subject for each category of content (Neutral, Negative, or Deficit-related). Performance on the original Hayling test (response inhibition speed and errors) was positively correlated with performance on the EHT ($r = 0.78$, $p < 0.01$ and $r = 0.81$, $p < 0.001$, respectively), indicating that the EHT is a valid test of verbal inhibition.

Procedure and Scoring

The original Hayling test and the EHT were administered in separate sessions scheduled at least two days apart. The original Hayling Test was administrated in the first session in all patients to increase their familiarity with the test's procedure and demands. In the second session, the instructions from the original Hayling Test (part 2) were again read out to participants. They were informed that a new series of sentences would be read to them. Sentences were read out clearly in a neutral manner and at steady pace. Participants were informed that they would be timed. Two practice examples were given to each participant, as in the original test. The sentences of the EHT were read out to participants in a random order, and timing began as soon as the last word of the incomplete sentence was read. Patients' answers were scored for reaction time in milliseconds using a handheld Samsung stopwatch.

The original Hayling Test's scoring guidelines and instructions were followed as closely as possible. As in the original test, reaction times and the following errors were noted: (a) Connected Completions and (b) Somewhat Connected Completions. For example, the answer 'hospital' to the sentence: 'An ambulance is often used to take assaulted people to the…' was considered a 'connected completion' error. The answer 'floor' to the sentence 'A hoist is often used to lift paralysed patients off the…' was considered a 'somewhat connected completion' error. Finally, the answer 'classroom' to the sentence 'A tow truck is often used to pull broken-down cars off the…' was considered a correct (unconnected) response. Unlike the original Hayling Test, reaction times were not rounded-up to seconds but were recorded in milliseconds. In addition, reaction times which were above or below 3 standard deviations of the participant's mean reaction time per sentence type were excluded from the analysis as outliers (Kampman et al., 2002). This occurred only twice and not in the same patient.

In a final, third session, scheduled at least two days after the EHT session, the 30 incomplete sentences of the EHT were read out to participants in a random order, and they

were asked to rate how much the theme of each completed sentence was relevant to them in their current situation on a scale from 1-10 (anchored at '1 - Not relevant to my current situation at all' and '10 – Extremely relevant to my current situation'). Their responses were not timed.

To summarise, both the AHP and HP groups completed an implicit awareness test consisting of a verbal inhibition task, which included sentences of varying emotional content (Neutral, Negative and Deficit-related). Subsequently, both groups were also asked to make explicit ratings of the self-relevance of the same sentences (explicit awareness task). It was expected that while the AHP patients would rate the Deficit-related sentences as less self-relevant than controls, they would be significantly slower than controls in completing the inhibition task (due to unconscious interference) with these sentences than with sentences of other emotionally Negative sentences (both relative to Neutral sentences).

3.3.4. Lesion Analysis Methods

Patient lesions were mapped on slices of the T1-weighted MRI scan template (ICBM152) from the Montreal Neurological Institute. This template is approximately oriented to match Talairach space (Talairach and Tournoux, 1988). All the lesion plots were drawn on the standard MNI space (2 x 2 x 2 mm) by one of us (SP), who was blind to which patient group each scan was from. By using the MRIcro software (http://www.cabiatl.com/mricro/mricro/index.html; Rorden & Brett, 2000), the template was first rotated to match the orientation of the MRI or CT patient scan. The scan images of the patient brain were then normalized and aligned (by digital image editing software) to superimpose to the rotated template slices. The patients' lesions were outlined on the rotated template, resulting in a map in which each voxel was labelled either 0 (intact) or 1 (lesion). Afterwards, the obtained three-dimensional volumes were rotated back to match the stereotaxic space of the MNI T1-weighted template by using the interpolation of the nearest-neighbour voxels. The derived volumes representing the lesions of each patient were superimposed onto the "automated anatomical labelling" (AAL) template (http://www.cyceron.fr/web/aal__anatomical_automatic_labeling.html; Tzourio-Mazoyer et al., 2002) to determine the lesion voxels of the different cerebral structures as calculated by the MRIcron software (http://www.cabiatl.com/mricro/mricron/index.html) (Rorden et al., 2007). The lesion involvement of white matter structures and connections was achieved by means of the lesion plots' overlap with the "White matter parcelation map" (WMPM) template (Mori et al., 2008).

3.4. Results

3.4.1. Explicit Awareness

The groups' explicit ratings of self-relevance to Deficit-related, Neutral and Negative sentences are depicted in Table 3.2. As expected, the AHP patients rated the Deficit-related sentences as less self-relevant than did the HP patients. This difference was not observed for the Neutral and Negative sentences. To verify the statistical significance of these differences we conducted a 2 (AHP group vs HP group) x 2 (Negative minus Neutral vs. Deficit-related minus Neutral sentences) ANOVA. This revealed that the self-relevance of sentences was rated as significantly different depending on their content, $F(1, 12) = 204.5$, $p < .001$, and that there was an interaction between patient group and the content of the sentences, $F(1,12) = 98.8$, $p < .001$. Post-hoc Bonferroni corrected t-tests ($\alpha = .025$) revealed that the two groups differed significantly in the difference 'Deficit-related minus Neutral sentences' ratings, $t(12) = 3.7$, $p < .025$. This difference was not significant for the composite measure of Negative sentences (Negative minus Neutral sentences ratings), $t(12) = 0.4$, $p = 0.7$. These results confirm that the AHP patients rated the Deficit-related sentences as significantly less self-relevant than the HP group, relative to both groups' ratings of Neutral sentences.

Table 3.2. Groups' Performance on the Emotional Hayling Test (EHT)

EHT Scores		**AHP** (N =7)	**HP** (N = 7)
		Mean (SD)	Mean (SD)
Explicit (Ratings)			
	Negative	1.9 (0.4)	1.8 (0.7)
	Neutral	3.1 (1.7)	3.5 (2.3)
	Deficit*	3 (0.8)	7.9 (0.6)
Implicit (RTs)			
	Correct and Error Responses		
	Negative	8.4 (7.4)	8.2 (5.5)
	Neutral	7.6 (8.4)	6.4 (2.8)
	Deficit*	17.7 (16.5)	5.7 (2.9)
Implicit (RTs)			
	Correct Responses Only		
	Negative	5.9 (4.4)	7.2 (3.6)
	Neutral	6.7 (7.4)	4.5 (1.8)
	Deficit*	16.8 (17.2)	3.7 (2.2)
Implicit (Errors)			
	Negative	4.7 (2.6)	5 (2.4)
	Neutral	4.4 (2.6)	5.1 (2.3)
	Deficit	4 (2.7)	6.4 (2.6)

* Significant difference between the groups.

It is also noteworthy that all AHP patients rated deficit-related sentences as less self-relevant than any of the HP controls and their individual scores were significantly different from the mean of the HP control group, as determined by Crawford's test, a specialised test for the establishment of single dissociations in single neuropsychological patients (Crawford & Garthwaite, 2002; Crawford & Howell, 1998), *t*s = 4.8 - 7.7, *p*s < 0.002. These results confirm that our anosognosic patients, selected on the basis of two established tests of motor awareness (Berti e al., 1996; Feinberg et al., 2000), showed denial of their deficits in our experimental task both individually and as a group. This confirmed the validity of our novel explicit awareness task.

3.4.2. Implicit Awareness

Reaction Times (RTs)

The groups' average reaction times (RTs) in each content category for correct and error responses, as well as for correct responses only, are presented in Table 3.2. A first analysis explored the RTs of the two groups for both correct and incorrect responses (errors). A 2 (AHP group vs HP group) x 2 (Negative minus Neutral vs. Deficit-related minus Neutral sentences) repeated measures ANOVA revealed that RTs were not overall significantly different depending on the sentence content, $F(1, 12) = 2.7$, $p = .12$, but there was a significant interaction between group and content of sentences, $F(1,12) = 8.2$, $p < .05$. Post-hoc Bonferroni corrected t-tests ($\alpha = .025$) revealed that the two groups differed significantly in the difference 'Deficit-related minus Neutral sentences' RTs, $t(12) = 3.2$, $p < .025$ but not in the difference 'Negative minus Neutral sentences RTs', $t(12) = 0.4$, $p = .66$.

A second analysis, explored the RTs of the two groups only for correct responses. In this analysis two subjects, AHP4 and HP5, who had less than 10 correct responses (22/30 and 24/30 errors, respectively) were excluded as outliers (see also Kampman et al., 2002). A 2 (AHP group vs HP group) x 2 (Negative minus Neutral vs. Deficit-related minus Neutral sentences) repeated measures ANOVA revealed that RTs were not overall significantly different depending on the sentence content, $F(1, 10) = 1.7$, $p = .22$, but there was a significant interaction between group and content of sentences, $F(1,10) = 6.34$, $p < .05$. Post-hoc, Bonferroni corrected t-tests ($\alpha = .025$) revealed that the two groups differed significantly in the difference 'Deficit-related minus Neutral sentences' RTs, $t(10) = 2.6$, $p < .025$ but not in the difference 'Negative minus Neutral sentences RTs', $t(10) = 1.7$, $p = .1$.

Error Analysis

The groups' average error rates in each content category are presented in Table 3.2. A 2 (AHP group vs HP group) x 2 (Negative minus Neutral vs. Deficit-related vs. Neutral sentences) repeated measures ANOVA revealed that the number of errors was not significantly different depending on the sentence content, $F(1, 12) = 0.5$, $p = .59$ and there was no significant interaction between group and content of sentences, $F(1,12) = 2.7$, $p = .12$. Although this last interaction was not significant, an additional analysis was performed to rule out the possibility that the above significant differences in total RTs (for both correct responses and errors) were a function of different error rates between the groups. A 2 (AHP group vs HP group) x 2 (Negative minus Neutral vs. Deficit-related minus Neutral sentences) repeated measures ANOVA was conducted on RTs with the number of errors each patient produced per content category used as a covariate. All interactions of sentence content*covariate were not significant, while the interaction sentence content*group remained significant, $F(1,12) = 6.2$, $p < .05$.

In summary, the study found that AHP patients rated Deficit-related sentences (relative to Neutral sentences) as significantly less self-relevant than did HP patients (explicit task). By contrast, the two groups did not differ in their self-relevance ratings of Negative sentences (relative to Neutral sentences). Crucially, AHP patients were significantly slower than HP patients in inhibiting automatic responses to the Deficit-related than the Negative sentences, relative to Neutral sentences (implicit task). These results show a clear dissociation in performance between the implicit and explicit awareness task in AHP patients.

3.4.3. Individual Patient Analysis

The specialised Revised Standardized Difference Test (RSDT; see above) was used to explore how many of our AHP patients differed significantly from our control sample in their explicit ratings and implicit responses to deficit-related sentences. This method was applied to the differences between Deficit-related and Neutral sentences in explicit ratings versus implicit RTs, as these were the differential measures that were found to be significantly different between the two groups (see above). As above, the RTs for correct responses only and for correct and incorrect responses were analysed separately.

The RSDT test indicated a significant dissociation in all AHP patients except AHP7, either when considering correct responses and errors ($t_6 = 1$, $p = 0.17$), or only the correct responses ($t_6 = 1.3$, $p = 0.12$). These results are presented in Table 3.3. Given this difference, the differences between AHP7 and the rest of the AHP patients in all the neuropsychological

and psychometric tests administered were also examined. AHP7 scored within the range of the rest of the AHP patients on all of the neuropsychological tests, including the original Hayling Test. However, he did show a marked difference in self-reported depression, scoring 15 while the rest of the patients scored between 1 and 6 (mean 2.84; SD 2.86). He also showed the highest score on Anxiety (13; AHP patients mean 7.16; SD 4.25; range 2-12) and the lowest score on Self-esteem (15; AHP mean 22.67; SD 5.08; range 19-29). When assessed with the Crawford test (Crawford & Garthwaite, 2002), only the difference in depression scores was significant ($t = 3.94$; $p_{(two\text{-}tailed)} < 0.05$).

Table 3.3 Individual Differences in Explicit and Implicit Performance

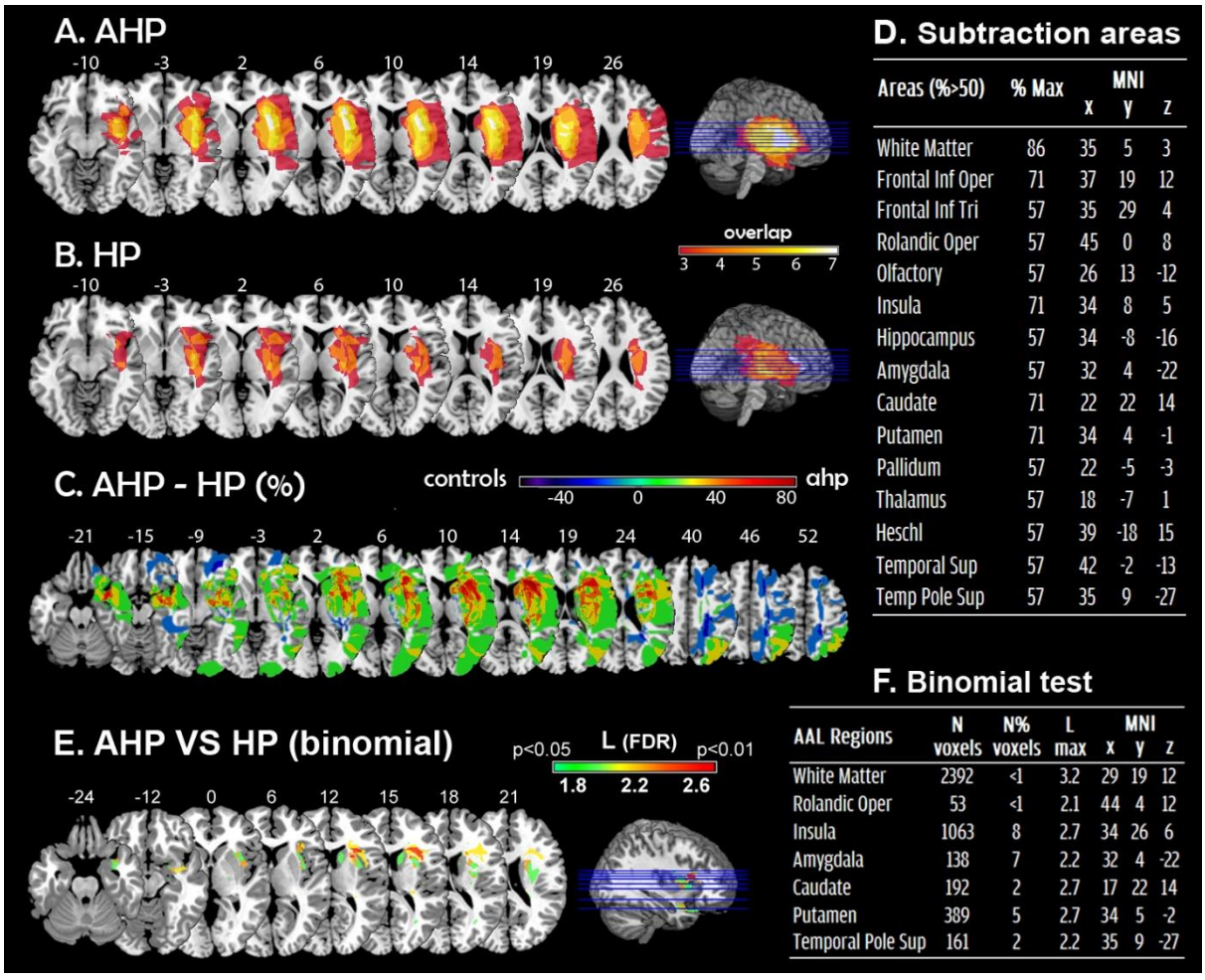
		HP Group Mean (SD)	AHP 1	AHP2	AHP3	AHP4	AHP5	AHP6	AHP7
Explicit Rating	Neutral	3.5 (7.9)	5.1	1.7	4.8	1.5	4.8	2.3	1.4
	Deficit	7.89 (0.7)	2.3	3	2.1	4.3	3.7	3	2.5
Implicit RTs (Correct & Errors)	Neutral	6.4 (2.8)	1.51	6.58	6.23	6.16	4.54	26.15	2.34
	Deficit	5.73 (3)	3.02	13.42	15.38	20.45	16.23	52.14	3.53
Implicit RTs (Correct only)	Neutral	4.45(1.9)	1.46	7.21	4.51	Excl	3.74	21.27	2.18
	Deficit	3.73 (2.2)	2.96	14.79	14.05	Excl	15.24	50.00	3.84
RSDT: Explicit Rating Diff. Vs RTs Diff. (Correct & Errors)	t (7)		2.2	1.7	4	3.9	4.2	6.7	1
	p(one-tailed)		.04*	.07*	.004*	.004*	.003*	.0001 *	.17
RSDT: Explicit Rating Diff. Vs RTs Diff. (Correct only)	t (6)		2.1	4	4	Excl	4.1	7.5	1.3
	p(one-tailed)		.04*	.004*	.004*	Excl	.003*	.0001 *	.12

* Significant difference between the patient and the control HP group.

Lesion Analysis

All the lesions resulted from a single ischaemic or haemorrhagic stroke and were confined to the right hemisphere, mainly in the territory of the right Middle Cerebral Artery (MCA). In the AHP patients, AHP1, AHP5 and AHP7 suffered from large hemispheric brain lesions affecting most of the right MCA territory, involving cortical and subcortical areas. Patients AHP2, AHP3 and AHP4 had subcortical damage mainly affecting the basal ganglia,

the insula and the surrounding white matter. Patient AHP6 showed a hemispheric lesion, mostly subcortical but extending to the medial parts of the frontal and occipital cortex. Figure 3.1A illustrates the lesions overlapping in three or more AHP patients. In the control group, HP2, HP3 and HP4 patients had lesions which were mostly subcortical, extending from the thalamus and the basal ganglia to the insula and the surrounding white matter. HP1 and HP6 had fronto-temporo-parietal hemispheric lesions; HP7 had a frontotemporal lesion; and HP5's lesion involved mainly dorsomedial cortical areas and the deep white matter. Figure 3.1B illustrates the lesions overlapping in more three or more HP patients.



D. Subtraction areas

Areas (%>50)	% Max	MNI x	y	z
White Matter	86	35	5	3
Frontal Inf Oper	71	37	19	12
Frontal Inf Tri	57	35	29	4
Rolandic Oper	57	45	0	8
Olfactory	57	26	13	-12
Insula	71	34	8	5
Hippocampus	57	34	-8	-16
Amygdala	57	32	4	-22
Caudate	71	22	22	14
Putamen	71	34	4	-1
Pallidum	57	22	-5	-3
Thalamus	57	18	-7	1
Heschl	57	39	-18	15
Temporal Sup	57	42	-2	-13
Temp Pole Sup	57	35	9	-27

F. Binomial test

AAL Regions	N voxels	N% voxels	L max	MNI x	y	z
White Matter	2392	<1	3.2	29	19	12
Rolandic Oper	53	<1	2.1	44	4	12
Insula	1063	8	2.7	34	26	6
Amygdala	138	7	2.2	32	4	-22
Caudate	192	2	2.7	17	22	14
Putamen	389	5	2.7	34	5	-2
Temporal Pole Sup	161	2	2.2	35	9	-27

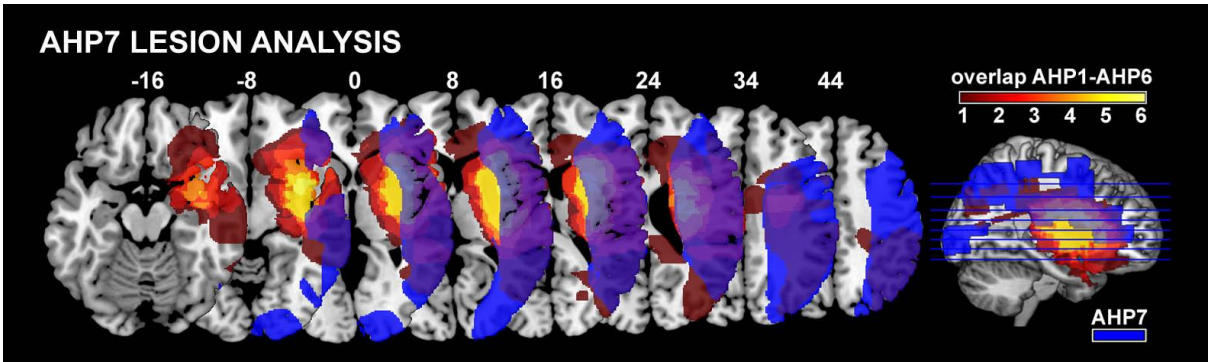
FIGURE 3.1. A. Overlays of regional lesion plots of minimum three AHP patients (MNI coordinates of the centre of mass: x=39, y=-16, z=16). The number of overlapping lesions is illustrated by different colours coded for increasing frequencies, from red (lesion in three patients) to light yellow (lesion in seven patients) **B.** The same colour codes and the same axial sections illustrate the overlapping lesions of minimum three HP patients (MNI coordinates of the centre of mass: x=38, y=-9, z=21). **C.** Subtraction lesion plots of AHP patients (positive overlap) with HP patients (negative overlap). The result of the subtraction is illustrated in percent numbers, different colours codes for increasing percentage, from purple (57% lesion in HP patients) to light yellow (71% lesion in AHP patients). **D.**

The table shows the damaged brain regions 'surviving' the subtraction in more than four AHP patients (57%); the maximum AHP overlap percentage and the MNI coordinates of the centre of mass are shown for each region. **E.** For each voxel, frequency comparison of lesions in AHP respect to HP patients was computed by means of the Liebermeister binomial measure (FDR corrected). In green, yellow and orange colours are the regions statistically significant at the 5% level (L = 1.77); in red colour are the regions statistically significant at the 1% level (L = 2.57). **F.** The table shows for each region the number (N) and the percentage (N%) of clustering voxels that 'survived' the threshold of $p<0.05$ (False Discovery Rate corrected) along with the maximum Liebermeister (L) statistic obtained in each cluster and the MNI coordinates of the centre of mass.

No significant difference was observed in the total volumes of the lesions in the AHP (mean 132 cc, SD = 110) and HP patients (mean 93 cc, SD = 98; $t(14) = 0.69$, $p = 0.68$). Subtracting HP lesion plots from the AHP lesion plots gave a cluster that remained present in at least 5 AHP patients. This cluster mainly involved the anterior part of the insula, and extended through the anterior corona radiata and the external capsule to the caudate and putamen nuclei (Fig. 3.1C, 3.1D).

By using the non-parametric mapping (NPM) software available with MRIcron, the study compared the frequency of lesion voxels in the two groups by computing a binomial test based on the Liebermeister measure (False Discovery Rates corrected), because this binomial test appears to be more sensitive than Chi-Squared or Fisher's Exact test. The significant areas emerging from the binomial test were in line with the subtraction results, namely revealing a superior cluster extending from the rolandic operculum and anterior insula to the caudate and putamen nuclei, and an inferior cluster involving the amygdala and the superior temporal pole. White matter tissue included the anterior corona radiata, the external capsule, the retro-lenticular part of internal capsule, and the uncinate fasciculus (Fig. 3.1E, 3.1F).

In order to explore a possible causal correlation between the lesions of AHP7 and his lack of implicit awareness, his lesions were also compared with those of the other AHP patients (see Fig. 3.2). The lesions of AHP7 overlapped with several of the common lesion areas of the other AHP patients, but showed more lesion voxels in posterior (posterior and medial regions of the occipital lobe), anterior (medial regions of the frontal lobe), and dorsolateral cortical regions (precentral and postcentral areas). He also showed fewer lesion voxels in limbic regions (e.g. amygdala), the basal ganglia and the external capsule.



Lesion only in AHP7 patient

Areas	Voxels	Area %	MNI x	MNI y	MNI z
White Matter	12154	<1	52	-67	-16
Frontal_Sup	2666	8	29	45	7
Frontal_Mid	18190	45	32	49	0
Cuneus	2970	26	10	-94	16
Lingual	2197	12	15	-100	-12
Occipital_Inf	2425	31	52	-66	-16
Parietal_Sup	5447	31	10	-81	48
Frontal_Mid_Orb	177	2	37	44	-10
Calcarine	2923	19	7	-97	-8
Occipital_Sup	3645	33	23	-85	3
Occipital_Mid	3760	23	29	-100	-1
Postcentral	12265	40	69	-8	14
Parietal_Inf	2023	19	56	-61	39
SupraMarginal	2052	13	51	-17	26
Angular	707	5	61	-58	23
Precuneus	596	2	18	-64	28
Temporal_Mid	431	1	66	-52	-8
Temporal_Inf	2809	10	52	-64	-16
Precentral	11403	42	54	-1	28
Frontal_Inf_Tri	1876	11	60	22	1
Frontal_Inf_Oper	1321	12	49	22	29

Lesion in AHP patients but AHP7

Areas (overlap in at least 5 patients)	Voxels	Area %	Max overlap	MNI x	MNI y	MNI z
White Matter	2697	<1	6	38	0	-16
Insula	1549	11	6	41	-1	-13
Caudate	90	1	6	18	15	6
Putamen	4667	55	6	32	1	-9
Temporal_Sup	143	1	5	42	-2	-13
Temporal_Pole_Sup	14	<1	5	42	3	-14
Pallidum	811	37	5	27	-11	-5
Amygdala	13	<1	5	32	-4	-13

Common lesion between AHP patients and AHP7

Areas (overlap in at least 6 patients)	Voxels	Area %	Max overlap	MNI x	MNI y	MNI z
White Matter	6470	<1	7	39	-15	-8
Insula	6401	45	7	41	-13	-7
Caudate	307	4	7	22	17	13
Putamen	1813	21	7	34	-15	-4
Rolandic_Oper	198	2	7	47	4	7
Temporal_Sup	150	<1	6	43	-11	-9
Frontal_Inf_Oper	420	4	6	42	16	4
Frontal_Inf_Tri	33	<1	6	35	29	4
Heschl	137	7	6	40	-20	5

FIGURE 3.2. Regional lesion plot of patient AHP7 (in blue colour, centre of mass: x=41; y=-22; z=23). The red and yellow colours represent the lesion voxels of the other six AHP patients. The number of overlapping lesions is illustrated by different colours coded for increasing frequencies, from dark red (lesion in one AHP patient) to light yellow (lesion voxels overlap in 6 AHP patients). The three tables provide a quantitative estimate of the region plots lesioned (a) in AHP7 but not in the other AHP patients; (b) in AHP patients excluding AHP7 and (c) finally the common lesions of the six AHP patients and AHP7. For each region, the number (N) and the percentage (N%) of lesioned voxels are shown.

3.5. Discussion

3.5.1. Summary and Implications for Neurocognitive Theories

I this section, I will first discuss the results of this study in the content of the neurocognitive literature to which they epistemologically and methodologically relate, before I go on to discuss their implications for existential theory and counselling psychology. The

present study used an inhibition task to study implicit processing of deficit-related material and a rating task to study explicit processing of the same material in left hemiplegic patients with and without AHP. The main behavioural finding was that patients with AHP were significantly slower than control patients in performing the inhibition task with deficit-related sentences than with other emotionally negative sentences, relative to neutral sentences in both cases. The main finding of the lesion analysis was that the lesions of the anosognosic patients differed from those of the controls by mainly involving the anterior parts of the insula, inferior motor areas, basal ganglia structures, limbic structures and deep white matter. The one AHP patient who did not show a behavioural dissociation (in the strict neuropsychological sense, see methods section) between implicit and explicit awareness of deficit showed more lesions in cortical frontal areas, including lateral motor and premotor regions, and also in the parietal and occipital lobes.

The selective slowing of responses to emotional stimuli in Stroop-like tests is considered to reflect 'unconscious' resource competition between the processing of emotionally threatening information and the requirement to complete the inhibition task (Wentura et al., 2000). Using the same language, our findings in the AHP patients may reflect a similar 'unconscious' response competition between the tacit processing of deficit-related information and the requirement to complete the inhibition task. By contrast, AHP patients did not differ from controls in their overall ability to perform the inhibition task as assessed by the original, standardized test of verbal inhibition (Hayling Test). Secondly, the observed effect of inhibition in the AHP patients was based on a differential slowing of response times for deficit-related versus neutral words, rather than an absolute measure of response speed (see also Nardone et al., 2007). Thus, it is unlikely that this effect relates to the general inhibitory abilities of the AHP patients. In addition, our AHP patients showed more lesions than HP patients in right limbic and insular cortex areas (see also below) and a corresponding reduction in the experience and communication of negative emotions (see Heilman & Harciarek, 2010 for review). Nevertheless, it is unlikely that our main experimental effect was driven by these emotional processing difficulties, or any general 'defence' function against negative emotions (see also below), as AHP patients did not show a tendency to process other emotionally negative themes differently than HP controls. Finally, it is unlikely that this effect related to dissociations between modalities (e.g. it is well known that patients with right hemisphere damage have better verbal than visuospatial abilities), as both the implicit and explicit tasks

required similar auditory, language, working memory and motor abilities in order to listen and respond to the same sentences.

Furthermore it should be added that while the Colour-Word Test (called the Stroop test in this thesis) and Part 2 of the Hayling Sentence Completion Test (called the Hayling in this paper) are widely used tests for inhibiton that typically require a verbal response and are contigent upon certain semantic abilities, they do not necessarily test the exact same aspect of inhibition, or frontal lobe function. Specifically, while some studies have found common lesion patterns for these two tests (see Cipolotti et al., 2016 for review) and have found comparable impairments in the same population (e.g. patients with Alzheimers disease, Belleville et al., 2006), controlling for individual differences in more generic dimension such as fluid intelligence has also revealed dissociations between the two tasks. For example, in a recent study, Cipolotti and colleagues (2016) found that patients with damage to the prefrontal cortex were significantly impaired compared with healthy controls on both the Hayling and the Stroop tests. However, when fluid intelligence was partialled out, there was no significant relationship between patients' performance on the two tasks, suggesting that the two tests may involve different kinds of inhibition, or other cognitive demands. Both tests require suppressing a dominant response, but they differ in other cognitive processes. For example, for the Hayling, strategy implementation is needed to generate semantically unrelated alternatives sentences. In contrast, for the Stroop, the response set is very constrained and, as such, may require less strategy. For the Stroop also, processes involved in response conflict may play a greater role compared with the Hayling. The automatic response that needs to be suppressed is presented in the test stimuli (i.e. the incongruent colour-word). This may induce more conflict than in the case of the Hayling, where the response that needs to be suppressed is not visually or aurally presented, but only semantically implied. Thus, any comparison between the two tests in this thesis should bear these differences into account. For example, it may nbe that the selective slowing of responses to emotional sentences in our Emotional Hayling test is not due to 'unconscious' response competition between the tacit processing of deficit-related information and the requirement to complete the inhibition task, but rather between the former demand and the need to generate an alternative strategy to resolve conflict. Future studies could adjust the Stroop procedure and compare between the two to specify the particular mechanisms involved in the implicit awareness seen in AHP patients.

Taken together, the above considerations suggest that the current study provides experimental support for implicit awareness of deficit in some anosognosic patients. In the

cognitive literature, implicit awareness has previously been hypothesised based on clinical observations (e.g. Ramachandran, 1995; Weinstein & Kahn, 1955) and case studies (Nardone et al., 2007). For example, Ramachandran (1995) reported an AHP patient who was retrospectively able to accurately comment on how long she had been paralysed during temporary lifting of the AHP following vestibular stimulation. Despite this temporary insight, after the stimulation effect wore off, the patient reverted to denying her paralysis and the admission of it during stimulation. Together with the present experimental findings of implicit awareness in AHP, these observations suggest that in at least some AHP patients there is a continuous, implicit appreciation of one's disabilities, despite patients' inability to integrate this implicit 'knowledge' into an explicit and 'realistic' awareness of the body as paralysed.

The present experimental confirmation of this dissociation is important because the combination of our behavioural and neuroimaging results may thus shed some light on the deficits leading to explicit unawareness in AHP and the potentially intact mechanisms responsible for implicit awareness.

Recent studies have postulated that explicit unawareness in AHP is caused by a deficit in monitoring the discrepancy between intended and actual movement (Frith et al., 2000; Berti et al., 2005; 2007). This deficit can lead to the construction of non-veridical motor awareness based entirely on unconscious signals of intended movement (Berti et al., 2007; see also Desmurget & Sirigu, 2009)[6]. This hypothesis has been supported by neuroimaging evidence (Berti et al., 2005); areas involved in motor preparation and planning (e.g. the supplementary motor area, SMA) were found to be spared in AHP patients. By contrast, lateral premotor regions, which are typically involved in monitoring discrepancies between intention and action, were selectively affected in these patients.

The neuroimaging results in the present study are consistent with the above proposals, in that motor areas around the rolandic operculum were more frequently damaged in AHP than HP patients. Moreover, as in the study of Berti et al. (2005) the SMA was spared in all our AHP patients. These results confirm the hypothesis that motor planning is intact in AHP

[6] The degree to which these unconscious signals are conceived as representational varies between the different scientific theorists and we will not be focusing on this debate in this thesis, given that as described in the Introduction, according to Merleau-Ponty, preflective awareness of the body is by deficition pre-reflective, pre-thematic and non-reprsentational. The tension between this view and mainstream cognitive approaches is acknowledged but there are exceptions in theoretical neuroscience (Friston
, 2010) and as discussed elsewhere (Fotopoulou, 2014), one can adhere to such non-representational models when considering certain empirical findings in neuroscience that can in principle be explained by both representational and non-representational acocunts (see also Chapter 4).

patients (Berti et al., 2005; Frith et al., 2000) and may lead some patients to form illusory awareness of movements (see also below). However, the dorsal premotor area (e.g. areas BA6) was not damaged more frequently in AHP than HP patients in the present study. In Berti et al.'s (2005) study, this was the brain region most frequently associated with AHP. In the present study, it was only affected in the one anosognosic patient who did not show implicit awareness. Only three other AHP patients had damage to this area and this damage was minimal. This finding suggests that an intact or almost intact lateral premotor cortex may be one of the neural areas that supports tacit, sensorimotor awareness into one's deficit, a habitual urge to move towards objects in the environment, despite the paralysis. Future studies will need to explore this finding further and consider the potential role of other brain areas (e.g. parietal areas) in residual sensorimotor monitoring processes and tacit, habitual awareness of one's action potentiality.

Whatever the outcome of such studies, however, our current experimental investigations further suggest that despite the existence of such implicit awareness of deficit, patients' maintain a more general, explicit belief that they can move. More broadly, the observed dissociation between tacit and explicit awareness is consistent with the observation that AHP sometimes has delusional features that cannot be explained solely on the basis of sensorimotor deficits (for discussion, see Introduction, as well as Ramachandran, 1995; Solms, 1999; Vuilleumier, 2004; Frith et al., 2000; Fotopoulou, 2010). The latter can perhaps explain the illusion of moving in the here-and-now (Berti et al., 2005), but AHP patients do not simply claim that they have illusions of moving. They instead ignore the wealth of evidence indicating that they are paralysed (e.g. their disabilities, occasional accidents and others' feedback) and they adhere to the delusional belief that they have functional limbs. The explanation of the latter belief therefore requires the postulation of a more general kind of awareness that concerns the body beyond the here-and-now of experience; one that extends selfhood in time and space (see Gallagher, 2000; Craig, 2009; Damasio, 1999 for more general discussions on such 'self' distinctions).

While this chapter has not experimentally tested this aspect of AHP directly, I discuss previous suggestions in the cognitive and psychoanalytic literature, and their relation with our neuroanatomical findings, before I go on to discuss these two facets of the patients' awareness,

tacit awareness and explicit denial, from the point of view of Merleau-Ponty's existential-phenomenological perspective. A number of cognitive theories have suggested that the delusional, explicit aspects of AHP can best be explained as an inability to attribute motor errors and other failures to oneself and update one's 'self-representation' accordingly (e.g. Ramachandran, 1995; Vuilleumier, 2004; Marcel et al., 2004). Interestingly, some of these authors have noted that negative emotions may be among the information that these patients fail to self-attribute and explicitly experience (see also next chapters). Observations of a sudden influx of depressive symptoms ('catastrophic reactions', Goldstein, 1939) during episodes of transient awareness have been noted in patients who are otherwise unaware of or indifferent towards their deficits (Kaplan-Solms & Solms 2000; Turnbull et al. 2005). In addition, it has been noted that some AHP patients, who appear emotionally unresponsive towards their deficits, tend nevertheless to experience disproportionately intense negative emotions about minor unpleasant situations and other people (Kaplan-Solms & Solms 2000; Fotopoulou & Conway, 2004). Some authors have argued that this lack of explicit awareness is caused by psychogenic 'defence' mechanisms directed against anxiety and depression (e.g. Weinstein & Kahn, 1955). However, as I mentioned in the Introduction, the relative neuroanatomical and behavioural specificity of anosognosic behaviours suggests that such purely psychological mechanisms are insufficient to explain AHP (for a recent, critical review, see Heilman & Harciarek, 2010).

Alternatively, other authors within the neurocognitive literature have argued that the fact that such 'denial' behaviours occur following specific brain lesions can allow us to put forward more parsimonious, empirically-informed accounts of brain mechanisms that, when damaged, can lead to such delusional behaviours and attitudes (see Fotopoulou, 2010 for discussion of this approach, heuristically labelled 'affective neuropsychology'). Accordingly, some have proposed that such inability to update one's explicit awareness of one's body may be the direct consequence of right-hemisphere dysfunctions that prevent awareness of motor failures and the corresponding negative emotions to be integrated with explicit awareness of the self. Candidate brain areas for such dysfunction are the right anterior insula and adjoining frontal areas. A plethora of recent neuroimaging studies have suggested that anterior parts of the insula seem to be responsible for the re-representation and integration of multisensory, motor and interoceptive information that is first processed in other cortical and subcortical areas and converge in mid-posterior insula (e.g. Critchley et al., 2004; for reviews see Craig, 2009; Tsakiris, 2010). Some authors have therefore proposed that the anterior parts of the right insular

cortex are key parts of a neural circuit that supports a stable, coherent and emotionally-embedded meta-representation of the body as one's own body (Damasio, 1994; Craig, 2009; Tsakiris, 2010). It is thus possible that in AHP patients damage to the right anterior insula and adjoining frontal areas contributes to impairment in the re-representation of information processed in other sensorimotor and emotional regions. This could render this information more likely to be ignored, or attributed to other people and causes (e.g. Kaplan-Solms & Solms 2000; Fotopoulou & Conway, 2004; Marcel et al., 2004) and less likely to be explicitly self-attributed.

This study, consistent with previous studies (Berti et al., 2005; Karnath et al., 2005; Baier & Karnath, 2008), found that the anterior parts of the right insula were differentially damaged in AHP patients. It should be noted however, that this damage included anterior and middle but not posterior parts of the right insula. Karnath and colleagues (Karnath et al., 2005; Baier & Karnath, 2008) proposed that the right posterior insula is uniquely associated with AHP. Berti et al. found that both anterior and posterior parts of the right insula were among the areas specifically associated with AHP. These discrepancies can potentially be explained by distinct patient recruitment criteria which are important to note particularly given the observed clinical heterogeneity of AHP. In the studies of Karnath et al. there was a high incidence of body ownership disturbances. This association has not been reported in other studies (e.g. Berti et al., 2005). In our study there was only one patient with indications of somatoparaphrenia (AHP5). Interestingly, in this patient, unlike the rest of the AHP patients, both the anterior and posterior parts of the insula were affected. Taken together, these findings suggest that the right anterior insula may be responsible for an integrated sense of bodily awareness that includes motor agency (see also Farrer & Frith, 2002; Craig, 2009), while the posterior insula may be a critical part of the network responsible for more basic interoceptive representation and body ownership (Craig, 2002; Olausson, et al., 2005; Tsakiris et al., 2007). Finally, our results, as well as those of previous neuroimaging studies on AHP (Berti et al., 2005; Karnath et al., 2005; Baier & Karnath, 2008), do not directly address the potential role of the left insula in body and emotional awareness (see Craig, 2009 for discussion). Nevertheless, it is noteworthy that some neuroimaging studies of motor and emotional awareness have found bilateral activation of insular cortex (e.g. Farrer & Frith, 2002). Interestingly, a recent study of a patient with epilepsy following herpes simplex encephalitis who developed Cotard's syndrome (a severe form of unawareness typically including the delusional belief that one is dead, or dying, as well as various other self-deprecatory delusions, suicidal ideation, feelings of guilt, and denial of body

parts) reported bilateral lesions to the insular cortex (McKay & Cipolotti, 2007). Future lesion studies could thus explore the specific roles of the right and left insular cortex in motor and emotional awareness and importantly their combined functional role.

Our results also suggest an association between AHP and subcortical lesions, including basal ganglia and amygdala damage. Vuilleumier (2004) has argued that damage to subcortical circuits (e.g. basal ganglia) that are involved both in motivation and in detection of "errors" might lead to an inability to revise beliefs based on novel perceptual experience and uncertain bodily states. It is also of interest that the lesions of the one patient (AHP7) who showed increased depression but not implicit awareness of deficit, did not include damage to subcortical areas such as the amygdala or the hippocampus and a lesser degree of damage to basal ganglia structures. In previous studies, bilateral medial prefrontal cortex and related limbic and striato-pallido-thalamic structures lesions have been associated with lower levels of depression than dorsal prefrontal areas, or more posterior lesions (for review see Koenigs & Grafman, 2009). Interestingly, patients with such lesions in the anterior limbic areas have been found to report low levels of "cognitive/affective" symptoms (such as guilt, self-dislike, and sadness) but normal levels of "somatic" symptoms (such as fatigue and changes in sleeping or appetite) (Koenigs et al., 2008).

Given the small sample and the inherent limitations of lesion analysis, the present findings regarding the various observed dissociations and their neural correlates are preliminary. Nevertheless, in combination with previous studies, they provide tentative new insights into the psychological and neural mechanisms of the multifaceted AHP syndrome. In short, our findings suggest that at least some AHP patients may show implicit awareness into their deficits, which seems supported by intact parts of the premotor cortex that typically support unconscious sensorimotor planning and related feelings such as the 'urge to move' (see also Desmurget & Sirigu, 2009). The results also appear consistent with cognitive theories that have proposed that most AHP patients suffer from a more general, delusion of first-person awareness linked with damage to the anterior insular cortex and some possible involvement of basal ganglia and limbic circuits. According to such theories, these lesions seem to impair patients' ability to affectively personalise sensorimotor information so that their conscious awareness is not updated based on current failures but rather remains linked to previous experiences and abstracted knowledge of one's abilities.

3.5.2. Implications for Existential-Phenomenological Theory

In this section, I explore how the present findings can be understood from the point of view of the existential-phenomenological perspective that Merleau-Ponty has put forward in his writings on anosognosia and embodiment more generally. In considering this perspective, I will also endeavour to discuss points of similarity and disagreement with some of the theories put forward to explain AHP in the cognitive literature, as outlined above.

As I discussed in the introductory section of the present chapter, a central point in Merleau-Ponty's analysis of AHP concerns the observation that patients with anosognosia show 'preconscious knowledge' (1945/1962; p. 93) of their paralysis. This raises the question of whether the present findings could be considered as an empirical confirmation of this existential-phenomenological observation, even as mere scientific approximations to the totality of the individual's lived body. An initial objection to this idea is the fact that the present results derive mainly from two language tasks that perhaps have little to do with patients own embodied experience. The patients are asked to listen to certain sentences, understand their meaning and respond to them by either inhibiting an automatic semantic association and speaking a random word (implicit task), or by explicitly rating their self-relevance (explicit task). At first consideration, a language-based task that involves consciously understanding the meaning of a motor-related sentence constructed by someone else sounds irrelevant to Merleau-Ponty's notion of the 'habit' or 'lived' body (1945/1962). As I explained above, these language tasks were necessitated by patients' paralysis (one cannot test at the level of motor observation how patients experience their motor potentiality towards the world as they cannot move their affected side at all), other impaired visuospatial abilities (e.g. neglect) and the reductionist need for tasks that can be comparable in their demand characteristics, i.e. in empirical tests of this kind the two domains to be tested need to be somehow 'balanced' in their difficulty and include the same modalities. Otherwise, differences in performance between them could be attributed to such unequal, or different demands in relation to the patients' more general cognitive function.

However, at closer inspection, there are at least two reasons supporting the idea that these findings can be put forward as empirical approximations of Merleau-Ponty's notion of 'preconscious knowledge', despite their necessary reductionist nature. The first point to be emphasized is that the critical aspects of the implicit task in question are not actually pure

semantic aspects. Specifically, what is measured in the task is not patients' ability to understand or verbalise disability-related concepts (these aspects are the mere baseline for the task) but rather the speed by which patients respond to them behaviourally (speech is the motor aspect of language) and their ability to respond by a word that is unrelated to the semantic content of the sentence. Thus, although the test requires subjects to engage with motor-related semantic content (versus other categories), the results are determined by their ability to respond behaviourally by going beyond such content. The second point to be clarified is even more important and it can be traced back to Merleau-Ponty's own understanding of language[7]. Specifically, Merleau-Ponty sees a certain kind of continuity between his ideas of embodiment and the motor aspects of language. When language is used, he claims, the spoken word and its meaning are the same thing (1945/1962), in the sense that the natural momentum of the body in its relation to the world, includes a conversion to vocal form, includes expressions and comprehension. Indeed, to understand the words of others is to also understand their motor intentions. Words seem to evoke meaning to the body directly, prior to any conscious elaboration. The word 'jump' involves a certain rearrangement of the 'schema corporel', similar to that of the experience of the body jumping.

Although a full discussion of Merleau-Ponty's view on language in relation to the lived body extends beyond the constraints of the present thesis, it is argued here that due to the above two points, there is at least some plausibility to the idea that the task used in the present study could offer empirical confirmation for Merleau-Ponty's suggestion regarding the preconscious knowledge of paralysis in patients with AHP. Moreover, the neuroanatomical findings of the study provide further, indirect support for this idea, in the sense that cortical areas liked to unconscious aspects of motor planning in other studies, have been found to be spared in these patients, as discussed above. Neural facts can never of course be substitutes for phenomenological considerations (see Introduction), and hence their relevance here is characterized as only indirect. Finally, the present findings reveal that, constistently with Merleau-Ponty's intuition, studying patients with anosognosia offers a rather unique vantage point from which to consider the paradox of bodily awareness. All but one of the presently tested patients showed signs of implicit awareness into their deficits and yet denied their paralysis unequivocally.

[7] At least in his early works. His view of language changes somewhat in his later work, as he is more influenced by theories on structuralism and semiotics (see Tiemersma,1989 for discussion).

As I mentioned above, in the cognitive literature this paradox is simply, and arguably simplistically (see Fotopoulou, 2014), solved by postulating that the mind is made of discrete parts (modules) and hence damage to one part may affect one modality of awareness, while leaving another intact. Accordingly, as I outlined above, the task of the cognitive neuropsychologist is to identify the brain areas selectively associated with the critical symptom and hence infer a direct, one-to-one relation between the damaged brain area and the mental ability in question. This modular model of the mind and its relation to the brain is nowadays rejected in strongest terms by neuroscientists themselves but unfortunately seems to still tacitly dominate mainstream cognitive neuropsychology and cognitive neuroscience (see Fotopoulou, 2014 for a critical review). As outlined above, in relation to AHP, this kind of epistemology has led to theories that consider explicit anosognosia as the direct consequence of lesions to the insular and limbic cortex, with potential involvement of the basal ganglia and other subcortical regions. These kind of theories, although increased in their sophistication, seem to maintain at the core the explanatory reasoning of older theories that looked for critical 'sensory' or 'feedback' deficits as the cause of AHP (see introduction). The common denominator between all these theories is that patients' conscious awareness is impaired because the conscious subject is lacking sufficient information about the body and hence its 'internal' representation of the body is somehow mistaken.

Merleau-Ponty's (1945/1962) perspective on anosognosia and the mind more generally differs drastically in this respect. In his view, the explicit unawareness of one's deficits is in direct relation to the implicit awareness of the deficit, despite their paradoxical antithesis. In other terms, patients do not show explicit unawareness despite their implicit awareness, but rather because of it. As aforementioned (see Introduction of the present chapter), in his view the syndrome is indeed best explained in relation to his account of the 'being-in-the-world' that cuts across the physical and the mental levels of explanation. Specifically, it is the patient's more general commitment to the world as the body itself 'knows' it tacitly, habitually and practically that drives one to deny one's paralysis in more abstract, reflective terms. The human natural momentum of being-in-the-world necessitates us to remain tacitly open all our habitual possibilities. As Merleau-Ponty (1945/1962) reflected, the patient with AHP is not simply ignorant of his paralysis, he instead evades his paralysis only in the sense that knows that he risks encountering it. Moreover, it is precisely this paradox between practically evading one's disability and yet being consciousnly ignorant of it that best reveals the nature of our embodied, impersonal existence in the world. The paradox of anosognosia is the paradox of a perceptual

world that is shaped by the primacy of people's embodied and active relation to the world, a world that is only secondarily perceived as perceptible. In other words, the paradox of anosognosia reveals the nature of consciousness itself as a (potentially distorting) first-person derivative of my very need to perceive, or be conscious of a world beyond the here-and-now of practical, embodied, egocentric experience. As Merleau-Ponty argues the anosognosic patient finds evidence of his 'intact' motor abilities in the very objects that disclose his motor deficiencies. Everyday objects elicit action potentialities at the same time as they reveal that these actions cannot be performed. Manipulatable objects, precisely in so far as they are perceived as manipulatable, appeal to the patient's arm in ways that he can no longer manipulate. Similarly, the body itself is consciously perceived not only in relation to experiences that are instantaneous, peculiar to body and complete in themselves, but also in some general aspect and in "the light of an impersonal being" (1945/1962; p. 95). Thus, in taking both our empirical findings and Merleau-Ponty' s ideas into account, I can conclude that patients with AHP continue to experience the embodied, habitual nature of the body in relation to things in their environment, at the expense of their perception of it in the fashion of objects, as it could be perceived by any one body, any one spatial position or point in time, or in other terms 'objectively'. The precise relation between this dynamic and the brain lesions observed in the patients of the present investigation is currently unclear and will require further epistemological considerations and empirical methodologies capable of capturing approximations of such dynamic relations at the level of the brain (e.g. what neuroscientists call functional and effective connectivity).

However, the consideration of Merleau-Ponty's ideas in relation to the present findings offer certain additional insights and thus predictions for further study also at the behavioural level. If the preconscious awareness of one's paralysis is indeed present in anosognosia, and if it relates among other aspects of embodiment to one's motor potentiality, and if as Merleau-Ponty claims it is due to this natural, habitual commitment of the body to such potentialities that more abstract forms of body consciousness need to abide to, then patients should be able to correctly perceive their non-movement when such action potentialities are not relevant and vice versa they should be more adamant in their anosognosic statements when called to action. Indeed, this hypothesis will be tested experimentally in the subsequent two chapters (chapters 4 and 5). In the meanwhile, however, the next section reflects on the implications of the above conclusions for counselling psychology.

3.5.3. Implications for Existential Counselling Psychology and Psychotherapy

First, as mentioned in the introduction, the consideration of AHP from this interdisciplinary perspective may be of relevance to the psychotherapeutic needs of anosognosic patients that are acknowledged by clinical psychology and neuropsychology but largely disregarded by the medical and psychotherapeutic professions. More generally, I hope that the results and reflections of the present chapter on anosognosia capture and bring to light the more general paradox of psychotherapeutic clients who frequently come to therapy consciously hoping to change their habitual ways of being-in-the-world while implicitly, yet with almost equal force, they may hope not to change their commitment to the world. Second, I will argue that this discussion on anosognosia exemplifies how therapists could work with the unconscious aspects of therapy from an existential-phenomenological perspective and without needing to revert to a kind of Freudian, sexualised and determined unconscious. I discuss these two issues in turn below.

Anosognosia and Existential Psychotherapy. As described in the introduction, AHP in the acute stage following stroke is associated with unique clinical challenges and it is considered a negative prognostic sign for longterm functional recovery. Yet, there is currently no specialised provision for the psychological treatment or management of AHP and related disorders in most Western countries (Jenkinson & Fotopoulou, 2014). Instead, in acute hospital words, AHP is frequently regarded as a neuropsychological deficit that needs to be identified as such, confronted and 'trained' in the same way that other physical symptoms like motor and posture difficulties need 'training' and 'exercise' in the physiotherapist's gym. Patients are thus repeatedly reminded of their 'correct' circumstances, their illness and their disabilities in frequent and 'instructive' ways under an approach called 'reality orientation' (Holden & Woods, 1995), thought of as important to help patients to achieve a more 'realistic' appreciation of their deficits. Although this approach has long been criticized for its rigidity and insensitivity towards the patient's emotions (see Spector et al., 2001 for a recent discussion), no alternative, psychotherapeutic approaches have been put forward for AHP following stroke.

In this context, the existential-phenomenological readings of the empirical findings presented above offer a specific perspective to the understanding and psychotherapeutic treatment of patients with stroke-induced anosognosia for hemiplegia. This condition has been

termed as unintentional by neurologists and as unrelated to personal goals and motivations (Bisiach and Geminiani, 1991). Also, these patients are considered emotionally indifferent and unable to experience negative emotions consistent with their paralysis (see Turnbull et al., 2005 for discussion). However, establishing that these patients may simultaneously have tacit knowledge into their deficit, and even more that this tacit knowledge is paradoxically intertwined with their conscious inability to perceive their deficits, offer psychotherapists and counselling psychologists, and more generally all clinicians, a different view of patients with AHP. Despite their counterintuitive nature, clinicians need to be mindful of such paradoxes in the consciousness and perception of one's own body and attempt to relate to patients in a manner that transcends the strict categories of consciousness, such as the 'presence' and the 'absence' of a deficit. A therapist can attempt to relate to patients' lived experience, including exploring their feelings about the body in the context of their lives (see also below), without the need to establish a commonly perceived 'reality', or 'world' in such 'objective' terms. For example, anosognosic patients who deny their paralysis have been clinically noted to complain violently, or express hopelessness for relatively minor events in their lives as perceived by others (e.g. their spouses), such as a misplaced fork or comb (Fotopoulou & Conway, 2004). Establishing the potentially minor practical impact of such events in their lives is no more useful than trying to convince them of the 'reality' of their deficit, as in 'reality orientation' approaches. Interpreting such complaints and experiences as related to the deficit, as traditional psychoanalytic approaches may propose (Weinstein & Kahn, 1955), may also act in a similar, unhelpful manner (see also below). Instead, a therapist informed by existential-phenomenological insights about patient's implicit knowledge as outlined above, may try to engage with the patient's own subjective experience about the meaning of the habitual body, exploring, describing and even validating their feelings and thoughts in the subjective and intersubjective context that they occur, while also progressively opening them up to further perspectives.

Indeed, Merleau-Ponty's concept of the 'horizon' (1945/1962) may be of use here. In some similarity to Husserl's concept of the 'life-world'[8], Merleau-Ponty argued that things are given to us against the background of a given world. This world has the structure of a horizon, which is constantly in flux as the particular context of our experiences may change. The things

[8] *For a discussion on the difference between Husserl's 'collective horizon' and Merleau-Ponty's 'horizon of all horizon's' please see Geniusas, 2012.*

we perceive in the world, including the body in conscious perception, may appear as determinate, specific and fixed in their boundaries, hierarchies and categories. However, according to Merleau-Ponty, such experiences occur always against a background that acts as an indeterminate, prereflective, non-thematic and opaque horizon of understanding. This is the horizon of lived, embodied experience that entails a much richer, dynamic repertoire of meanings than our conscious, 'neatly organised' reflections. Our conscious reflections on the world, as we saw even in relation to the conscious perception and appreciation of our own body, are not but mere abstract derivatives of that experience. In the case of the anosognosic, the perception and description of the physical body as able, familiar and present is therefore simultaneously the understanding of the body as disabled, estranged and lost. Patients have been noted to claim "of course I can walk". The cognitive, 'reality orientation' therapist may pay attention to the apparent disregard of 'reality' that the 'I can walk' portrays. For the existential psychotherapist, the 'I can walk' is no more or less important, separate or real than the 'of course'. Thus, such a therapist, may instead pay equal attention to both statements and their relation. They may enquire about what the 'of course' may mean for the patient. They may explore with the patient what such a statement may mean in the context of their lives, their relations, their self-regard, thus hopefully in time opening up the patient to further, potentially already experienced ways of being in the world (albeit in different contexts) that entail both ability and disability (e.g. the experience of being a child, a novice in something, of getting lost, of being ill, etc.).

This principle of 'horizontalisation' that warns against imposing any hierarchical prioritization of certain meanings, or themes, over others, no matter how intuitive such hierarchy and prioritization may sound, is dramatically highlighted by the anosognosic phenomena considered here. Stroke patients with anosognosia, when encountered in a psychotherapeutic context as clients, call upon us to bracket and horizontalise the very notion of the physical reality of the body. The body the patient speaks of is, and simultaneously is not, the body that lies paralysed in front of the therapist. The client, as any client, calls upon the lived body when interacting with the therapist, even at the very moments that he tries to describe his (anosognosic) appreciation of the physical body. It may seem easy and even comforting for the therapist to cling to the observable 'reality' of the paralysed limbs and try to engage the client in such reflections. However, as this chapter has attempted to highlight, such efforts would always leave behind the potentially uncomfortable, prereflective experience of the lived body as habitually active and currently paralysed and lost. I argue that

intersubjective explorations and sharing of such prereflective experiences and their associated meanings during psychotherapy may facilitate clients to arrive at a new subjective understanding of the body, in both reflective and prereflective terms, and a consideration of its role in their own, wider and changing 'world-horizon'.

Anosognosia and an Alternative to the Freudian Unconscious. As aforementioned, authors influenced by psychoanalysis have long offered readings of AHP and related clinical recommendations for its psychotherapeutic treatment (e.g. Weinstein & Kahn, 1955; for a recent review see Prigatano, 2005). Indeed, even Merleau-Ponty himself in his consideration of the phenomenon of AHP he explicitly refers to alternative psychoanalytic readings of the syndrome and the related notions of the 'unconscious' and 'repression' as used in classical, Freudian metapsychology. Specifically, clarifies that despite any superficial similarities between his notion of the pre-thematic, pre-reflective, lived experience and the Freudian unconscious, his views on anosognosia offer a drastically different view on such phenomena. As discussed above, the lived body is prior to abstract reflection and appreciation of the body as a present, 'thing in itself'. Lived experience more generally, as the alternative to a Freudian, drive-based and sexualised unconscious, is our pre-thematic, lived and habitual engagement with the world, from which all reflection derives and because of which all reflection is possible. For example, when we are trying to approach and grasp an object, we do not necessarily consciously reflect on all our prior experiences of reaching and grasping for objects. We instead may be conscious of our wish to grasp that object and of its nature as a three dimensional object with certain functions (e.g. a glass that you can lift to drink water). Nevertheless, our conscious knowledge of the glass is not limited to the perspective and action potentialities afforded by our body at the given moment. Instead the glass is perceived as a three-dimensional glass that could be seen and used from different (currently unseen and unused) perspectives, exactly because of our prior experiences with that and other similar objects and the affordances they entail to us and to other people. From this perspective, anosognosia is not the result of 'repression' due to the incompatibility (conflict) of our current perception of the body and our inner, unconscious wish to have an active body. Instead, anosognosia is the lived and pre-reflective experience of our body as habitually able that has not as yet found the motivation and maybe not even opportunity, or context, to thematise or reflect on that lived experience in conscious terms. The prereflective experience of the active body and the particular individual have had a history, intertwined with several meanings and habitual potentialities. One does not need the concept of unconscious conflict to assume difficulties in the process of suddenly

having to draw new conscious reflections, new abstractions about very body that one could take for granted since childhood and experience habitually as able. It is instead proposed that existential psychotherapy may have a unique role in engaging patients in reflections on their habitual body, opening up their horizon of understanding without the need to directly challenge their conscious beliefs and perceptions, nor interpret them as the by-product of other, hidden unconscious desires and infantile complexes.

3.6. Summary and Conclusion

This chapter examined whether it is possible to empirically explore a central point in Merleau-Ponty's analysis of AHP, namely the observation that patients with anosognosia show 'preconscious knowledge' (1945/1962; p. 93) of their paralysis. Although the conducted empirical study necessitated an epistemological reduction of the rich phenomena in question, within these constraints, the results of the experiment demonstrated that most patients with AHP show implicit (behavioural) indications of knowledge into their paralysis, while at the same time ignoring the same paralysis at explicit questioning. These findings were considered in relation to existential-phenomenological theory of body awareness. Moreover, points of similarity and disagreement with some of the theories put forward to explain AHP in the cognitive literature were discussed and finally, implications for counselling psychology and existential psychotherapy were considered.

4. The Role of Motor Potentialities in Motor Awareness: Experimental Evidence in Anosognosia for Hemiplegia

4.1. Summary

This chapter addresses the hypothesis of Merleau-Ponty that if the prereflective, habitual knowledge of one's body-in-the-world is what prevents the conscious awareness of one's paralysis, then the more a given environment elicits motor potentialities to a patient, the larger should the error be in the conscious perception of the body. However, no study has hitherto directly investigated the role of such conditions in the observed non-veridical awareness of action in AHP. I developed the following paradigm to investigate the role of motor intentionality in awareness in patients with AHP: Four hemiplegic patients with and four without anosognosia were provided with false visual feedback of movement in their left paralysed arm through a prosthetic rubber hand. I examined whether the ability to detect presence or absence of movement based on visual evidence varied according to whether the patient had planned to move their limb or not. Motor intention had a selective effect on patients with AHP; they were more likely than controls ($U = 16$, $p < 0.001$) to ignore the visual feedback of a motionless hand and claim that they moved it when they had the intention to do so (self-generated movement) than when they expected an experimenter to move their own hand (externally-generated movement), or there was no expectation of movement. By contrast, patients without AHP were not influenced by these manipulations, and did not claim they moved their hand when the hand remained still. This is the first direct demonstration that altered awareness of action in AHP reflects the dominance of motor habits and motor expectations prior to action over sensory information about the actual effects of movement.

4.2. Introduction

The previous chapter focused on the possibility that, as Merleau-Ponty (1945/1962) had suggested, patients with Anosognosia for Hemiplegia (AHP) show implicit, pre-reflective awareness into their deficit, even though they explicitly deny their paralysis. As I described there, contrary to cognitive theories on such phenomena, in Merleau-Ponty's understanding, the denial of one's motor deficits does not exist despite of one's pre-reflective, non-thematic understanding of the same deficits, but rather because of it. Specifically, it is the patient's more general commitment to the world as the body itself 'knows' it tacitly, habitually and practically that drives one to deny one's paralysis in more abstract, reflective terms. The human natural momentum of being-in-the-world necessitates us to remain tacitly open to all our habitual possibilities and the risk of encountering limitations in such possibilities may not automatically translate into conscious reflection. Instead, the latter is a potentially distorting, first-person derivative of my very need to perceive, or be conscious of a world beyond the here-and-now of practical, embodied, egocentric experience. My conscious body as part of this world, i.e. as an object of conscious perception and not as the lived body, is subject to the same principles. Thus, we perceived it not only in relation to experiences that are instantaneous, peculiar to body and complete in themselves, but also in some general aspect, from the perspective of anybody. From this general, abstracted perspective, the body of the anosognosic patient is able to move as always. This proposal raises at least two further, related empirical hypotheses: If the prereflective knowledge of one's paralysis is indeed present in anosognosia, and if it relates among other aspects of embodiment to one's motor potentiality, and if the maintenance of such potentialities necessitates the body to be perceived as able in conscious, abstract terms, then (1) the more such motor potentialities are called for, the larger should the error be in the conscious perception of the body and (2) the less such motor potentialities are called for, the smaller should the anosognosic error be in conscious perception. I will address the former hypothesis in a group study in the current chapter, while I will focus on the potential of reducing anosognosia in a single case design in the following chapter.

4.2.1. The Role of Motor Potentialities in the Neurocognitive Literature on Anosognosia

As described in the introduction, several authors have recently proposed that AHP may be best explained with reference to processes of motor planning, imagery and intentionality, rather than sensory feedback. The starting point of such proposals was not the phenomenological or existential traditions but were rather derived from recent computational models of motor control (e.g. Frith, Blakemore & Wolpert, 2000; but see Berendzen, 2014 for a recent example of their compatibility). Thus, I describe them here in their own epistemological and theoretical context, before I go on to integrate this literature with Merleau-Ponty's views in the discussion of this chapter. In such models, under normal circumstances, the formation of an intention to move will be used by brain operations summarised under the heading 'forward models', which are thought of as neurocognitive, predictive operations specialised to generate predictions about the sensory feedback the organism will encounter (including limb position sense) if they were to execute the intended action (Frith, Blakemore & Wolpert, 2000). If an intended movement is attempted and it is successful, then it is assumed that conscious awareness is informed mainly by the predictive, 'forward models', largely ignoring the actual state of the organism. However, if an action is not performed as planned, another set of specialised operations, summarised as 'comparators', are thought of as responsible for detecting mismatches between the predicted and received sensory feedback and informing conscious awareness.

Berti et al (2007), following Frith et al. (2000) hypothesised that patients with AHP form appropriate representations of the desired and predicted positions of the limb, but they are not aware of the discrepancy between their prediction and the actual position. On this view, patients' awareness is dominated by intention, and does not take into account the failure of sensory evidence to confirm the execution of the intended action. AHP arises because action awareness is based on predictions of the effects of motor commands sent to the plegic limb and sensory evidence about lack of movement is not processed appropriately by the 'comparators'. Accordingly, AHP may involve damage to the brain areas that underpin the monitoring of the correspondence between motor outflow and sensory inflow (e.g. Brodmann's premotor areas 6 and 44; Berti et al., 2005), or else contrary sensory information is neglected (Frith et al., 2000). Consequently, the mismatch between the predicted state (i.e. movement of the limb) and the actual state (i.e. no movement) is not registered.

Notwithstanding the theoretical interest of the above hypothesis, and its potential compatibility with some of the principles behind Merleau-Ponty's views on consciousness of the body, to my knowledge, no study has hitherto directly investigated the role of motor

intentions, or predictions in the generation of a positive symptom in AHP, namely, their non-veridical awareness of action. Berti and colleagues (Berti et al., 2005; 2007) have provided convincing evidence that motor planning is intact in AHP (against the Heilman et al., hypothesis), but to our knowledge no study has been able to demonstrate that motor planning dominates awareness of action in AHP. Such a demonstration would require an experimental situation in which sensory feedback relevant to the arm that the patient could normally detect was nevertheless not detected when patients formed a motor intention to move the arm and thus had the relevant motor potentialities 'in mind'. This was the aim of the current experimental study.

Specifically, I developed an experimental paradigm to test the hypothesis that awareness of a movement is based primarily on motor planning, and that this information dominates over sensory feedback. Because AHP patients typically have somatosensory loss (Cutting, 1978), the study focussed on visual feedback from the limb rather than somatosensory feedback. Visual feedback of action plays an important role in action awareness, as shown in self-recognition studies with healthy participants (Tsakiris et al., 2006; van den Bos & Jeannerod, 2002). The study therefore used a realistic prosthetic hand to generate visual feedback of movements that the patient either commanded themselves (self-generated movement; maximum motor planning is involved) or were controlled by an experimenter (externally-generated movement; minimum motor planning is needed). In some conditions, I gave visual feedback that was incompatible with the patient's predictions. In particular, in the critical condition, patients were instructed to move their left hand themselves, but the prosthetic hand remained still. These conditions essentially mirrored the classic anosognosic scenario within an experimentally controlled procedure (cf. Ramachandran, 1995). I hypothesised that if motor planning (motor intentions and related potentialities) dominates over sensory feedback in AHP, patients would fail to perceive the prosthetic hand's lack of movement. Thus, if asked to detect movements of their left arm, they would make more errors (false alarms) in this critical condition (self-generated movement) than in the externally-generated movement conditions.

4.3. Materials and Methods

4.3.1. Participants

Eight adult neurological patients were consecutively recruited from an acute stroke unit in a first phase of the overall study (see Chapters 2 and 3). Inclusion and exclusion criteria were as described in Chapters 2 and 3, and the smaller cohort of patients recruited for this experiment were simply the ones available to conduct this experiment for practical purposes (e.g. time scheduling issues at the hospital, worsening of medical and cognitive condition). Descriptions and analyses of their characteristics and neuropsychological performance are therefore summarised here again, as they constitute a smaller sample with presumably differences in average performance. Patients were classified as having AHP as described in Chapter 2; there were four right hemisphere damaged patients with complete left upper limb hemiplegia and AHP (AHP = experimental group) and four right hemisphere damaged patients with complete left upper limb hemiplegia but without AHP (HP= control group). All participants gave informed consent and the study was approved by the local Trust's Ethical Committee (see Chapter 2).

All patients had lesions mainly in the territory of the right Middle Cerebral Artery (MCA), involving frontal, temporal and parietal lobes, and subcortical involvement of the basal ganglia, the insula and the internal capsule. Figure 4.1 illustrates the lesions of the patients as documented by clinical CT or MRI scans. The lesions showed variability typical of the literature (for an extensive meta-analysis see Pia et al., 2004). In the AHP group patients, A1 had a frontoparietal lesion extending to subcortical areas, patients A2 and A3 showed large lesions affecting most of the right MCA territory, and patient A4 had focal subcortical damage mainly affecting the basal ganglia. The lesions of the control HP patients were equally varied. Due to the small sample and variation of the neuroradiological findings, precise volumetric analysis and detailed lesion mapping analysis and contrasts were not warranted (see previous Chapter for a volumetric studies of the larger group; see also Berti et al., 2005; Karnath et al., 2005 for similar samples).

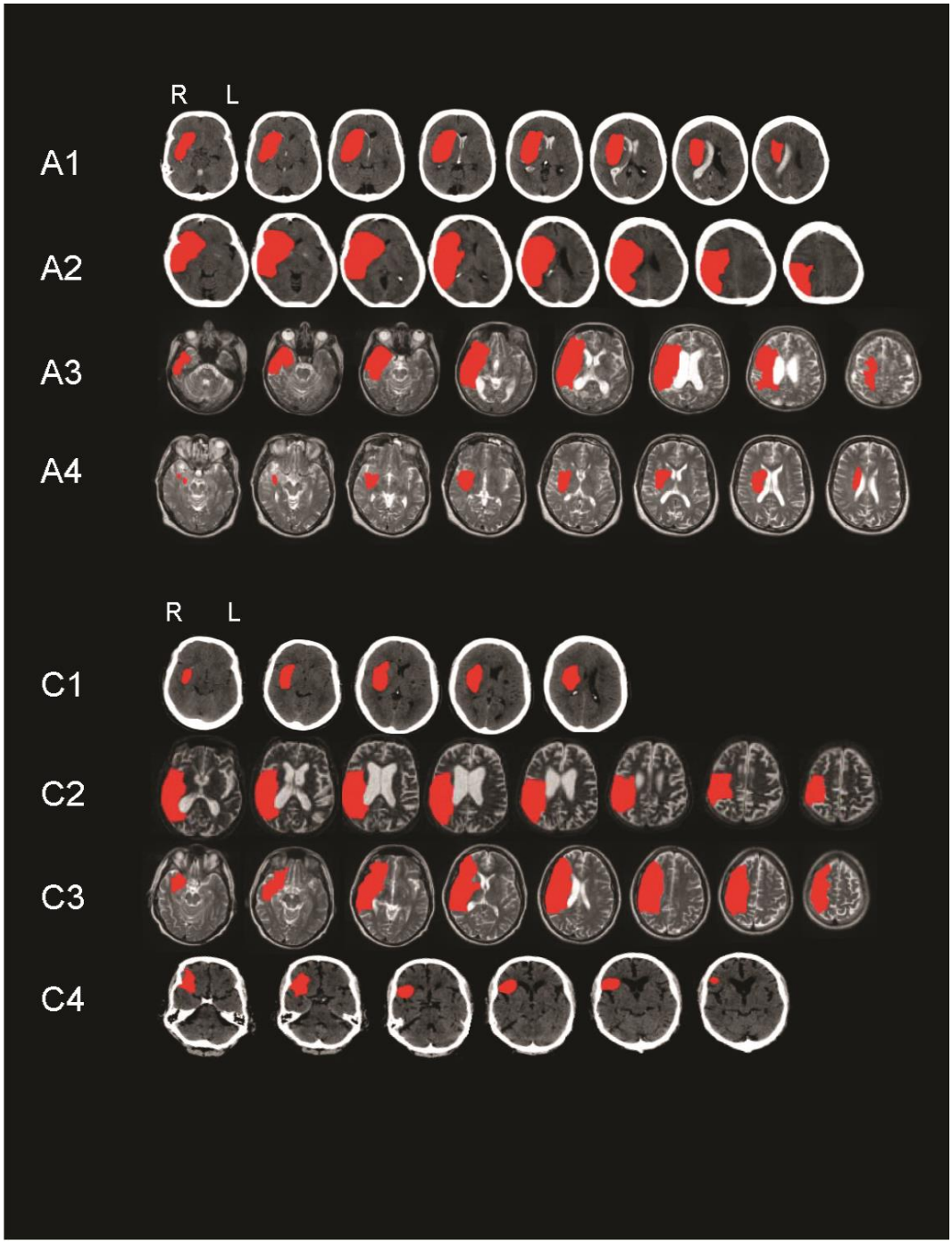


FIGURE 4.1. Individual patients' lesions in the two groups represented in red. Patients A1-A4 formed the AHP group and patient C1-C4 formed the Control HP group. All patients had lesions affecting the territory of the right middle cerebral artery.

4.3.2. Neuropsychological Assessment

In addition to the anosognosia tests mentioned above, the patients were assessed using the standardised neuropsychological tests described in Chapters 2 and 3. Patients' demographic

characteristics and their performance, averaged across the groups of this particular chapter, on standardized neuropsychological tests are summarized on Table 4.1.

Table 4.1. Groups demographic characteristics and neuropsychological profile

	AHP		HP controls		Mann-Whitney Test	
	Mean	**SD**	**Mean**	**SD**	***Z***	***p***
N	4	-	4	-	-	-
Age in yrs	63.75	5.95	61.00	22.79	0.00	1.00
Education in yrs	12.75	2.87	12.00	2.83	0.73	0.30
Days from Onset	20.0	13.23	19.75	3.30	0.00	0.40
Premorbid IQ– WTAR¶	112.67	13.05	104.75	7.72	0.00	0.40
WAIS – III¶ Vocabulary	9.75	4.65	8.75	2.99	0.30	0.38
WAIS – III Similarities	9.50	3.11	10.25	2.50	0.29	0.38
WAIS – III Digit Span	10.25	3.50	9.25	1.71	0.44	0.36
WAIS – III Matrix Reasoning	6.33[1]	2.52	8.33	2.52	0.89	0.27
WAIS – III Arithmetic	7.67	3.21	8.67	2.31	0.70	0.31
Visual Fields¶ R	9.25	0.50	10.00	0.00	2.05	0.11
Visual Fields L	3.25[1]	3.40	6.25[1]	2.06	1.48	0.20
Visual Fields Both	1.00[1]	1.41	2.25[1]	1.71	1.04	0.34
RASP¶ Surface Touch L - Max 30	6.75[1]	3.86	7.50[1]	3.87	0.29	0.88
RASP Surface Touch/Spam Max 10	5.00[1]	2.44	4.75[1]	1.70	1.00	1.00
RASP Extinction - Max 12	3.66[1]	6.35	6.50[1]	2.12	0.59	0.80
RASP Proprioception - Max 30 Movement Detection L	6.75[1]	3.30	6.50[1]	4.04	0.15	0.89
RASP Proprioception - Max 30 Direction Detection L	4.45[1]	2.87	3.50[1]	3.69	0.44	0.69
Comb/Razor Test¶ R	27.5	16.7	25.50	1.29	1.00	0.34
Comb/Razor Test L	13.75	17.35	20.00	5.42	1.16	0.34
Comb/Razor Test Ambiguous	10.75	11.53	8.75	8.18	0.14	0.88
Comb/Razor Test Bias	-0.39[1]	0.32	-0.10	0.11	1.7	0.11
Bisiach Test¶	1.00	0.50	0.00	0.00	1.53	0.13
BIT¶ Total Score	84.75[1]	29.54	96[1]	35.31	0.43	0.66
Line Crossing R	18	0	17.25	0.95	1.50	0.30
Line Crossing L	6.75[1]	6.16	15.75[1]	3.3	2.00	0.06*[1]
Letter Cancellation R	16	2.82	14.75	2.36	0.60	0.20
Letter Cancellation L	6.25[1]	3.3	12.25[1]	5.5	1.40	0.70
Star Cancellation R	21.5	7.59	23	4.08	0	1
Star Cancellation L	8.5[1]	10.63	20.75[1]	4.11	1.60	0.10
Copy	1[1]	1.41	3	1.15	1.80	0.08*[1]
Representational Drawing	1.33[1]	1.15	2.75	0.5	1.90	0.56
Line Bisection R	3	0	2.5	1	1.00	0.30
Line Bisection Centre	2	1.41	2.25	1.5	0.50	0.61
Line Bisection L	0.75[1]	0.95	1.5[1]	1.73	0.60	0.50
Berti Awareness¶ LUL	1.5	0.6	0.00	0.00	2.50	< .05*
Berti Awareness¶ LLL	1.75	0.50	0.00	0.00	2.50	< .05*
AHP Questionnaire¶	5.1	0.9	0.63	0.48	2.82	< .05*
Hayling Test RTs	2.00[1]	1.15	3.00[1]	2.31	0.62	0.33

Hayling Test Errors	4.00	1.83	3.50	2.89	0,30	0.40
Proverbs¶	8.00	3.61	11.50	5.74	1.08	0.22
Cognitive Estimates¶	10.00[1]	2.71	9.33[1]	1.15	1.08	0.22
HADS¶ Depression	4.00	2.83	7.50	5.97	1.04	0.30
HADS¶ Anxiety	7.75	5.06	9.00	6.58	0.00	1.00

[1] Scores below tests' cut-off point, or more than 1 SD below the average mean

*Significant differences between the groups, $p < 0.05$

*[1]Trends towards significance, $p < 0.10$

¶WTAR = Wechsler Test of Adult Reading (Wechsler, 2001); WAIS-III = Wechsler Adult Intelligence Scale - 3rd Edition (Wechsler, 1998); Visual-fields = The customary 'confrontation' technique (Bisiach et al., 1986); BIT Total score = sum of scores of the conventional sub-tests of the Behavioural Inattention Test; 'One Item Test' and 'Comb/Razor Test'= Tests of Personal Neglect. Bias on the latter is calculated according to McIntosh et al., 2000; RASP = The Rivermead Assessment of Somatosensory Performance (Winward, Halligan & Wade, 2002); Proverb Test = Delis Kaplan – Executive Functions System - Proverbs Subtest (Delis, Kaplan & Kramer, 2001); HADS = Hospital Anxiety and Depression Scale. Awareness Interview = Berti et al. 1996 Awareness Interview and Awareness Questionnaire = Feinberg et al. 2000 Awareness Questionnaire.

As shown in Table 4.1, the groups did not differ in age (range in years 38-83), education or post-onset assessment time. As expected the two groups differed significantly in the two awareness interviews used; the Awareness Interview (Berti et al., 1996) and in AHP Questionnaire (Feinberg et al., 2000). Interestingly, three of the four AHP patients claimed they did move their paralysed left limbs during the awareness tests, while the HP patients immediately acknowledged that the task was impossible for them. Their awareness scores were consistent with patients' spontaneous behaviour; the HP patients acknowledged their paralysis spontaneously and never attempted to move without assistance. By contrast, the AHP patients tended to deny or minimise their motor deficits in spontaneous behaviour. All four patients explicitly stated that they could move their left arm, had attempted to stand on their own at least once and repeatedly expressed hostility towards staff and relatives for forbidding them from getting up and walking on their own or, performing bimanual tasks. In addition, all four patients falsely claimed (confabulated) that they had been moving their left side while in hospital (e.g. "Of course, I can use my left arm. How do you think I scratch my right arm when it is itchy during the night?"). One patient showed somatoparaphrenia in spontaneous behaviour in that she insisted her left arm was her husband's arm (patient A2 in Fig. 4.1).

The two groups did not differ in their general premorbid or postmorbid intelligence scores and there were no significant differences in their reasoning abilities as measured by two frontal tasks. However, it should be noted that both groups performed worse than expected by their premorbid IQ on the WAIS-III Performance subtest Matrix Reasoning and on the

Cognitive Estimates Test (normal range is 2-6). Both groups showed some degree of visuospatial, sensory and personal neglect but this appeared more severe in the AHP group. It is of interest that the AHP scored below cut-off levels in the Comb/Razor Test, while the HP group did not. The differences between the groups on two visuospatial Neglect Tests (Left side Line cancelation and Copy) approximated significant levels ($p < 0.10$) (see Table 4.1). It thus seemed that AHP had overall more severe neglect than HP patients, but variability was noted among patients of both groups and given the small samples assessed, differences were non-significant. Finally, AHP patients showed lower scores for depression and anxiety on the HADS comparing to HP patients. However, the scores of the two groups did not significantly differ and they were considered to be within normal limits for a patient population in a general hospital.

4.3.3. Experimental Investigations

Design

The experiment assessed whether the intention to act (i.e. move one's left hemiplegic hand) influenced the perception of movement of the same hand in hemiplegic patients with or without AHP. Motor intention was manipulated by instruction at three different levels: self-generated movement (patients were instructed to raise their left arm), externally-generated movement (patients were told that an experimenter will lift their [the patient's] left arm) and no-movement instruction. Visual feedback of movement was manipulated at two levels: Movement, no movement. This allowed for a 2 x 2 x 3 design (see Table 4.2 and Appendix V). The experimental factors were: (a) group (patients with AHP, patients with HP); (b) the visual feedback of hand movement (movement/no movement); and (c) the motor intention (self, external, none).

Table 4.2. Table summarizing the experimental design

Instruction	Rubber-Hand	
	Movement	No Movement
Self-generated movement	6 trials	6 trials
Externally-generated movement	6 trials	6 trials
No movement instruction	6 trials	6 trials

Dependent Variables

Dependent variables included (a) movement detection scores: "Did your left hand move?" (YES/NO response); (b) confidence rating on measure a (Likert-type scale 1-7); (c) agency scores over the observed movement: "Did you or someone else move your hand?" ('Me/Someone else' response).

Materials and Procedure

The aim of the experiment was to assess whether patients' intention to act influenced their awareness of movement of the same hand. As hemiplegic patients cannot move their left arm, a life-sized rubber model of a left hand and arm was used to create false visual feedback of left hand movement. Prosthetic hands were used because they can be easily manipulated by the experimenters, they are quite realistic, and moving them does not elicit somatosensory signals. A suitable rubber hand was selected for each patient in order to resemble each patient's own (real) hand in terms of size, shape, skin tone, and freckles. The rubber hand was placed on a hospital table in front of the patients (by an assisting experimenter seated at the left of the patient and holding the proximal end of the rubber hand), while their vision was temporarily blocked. The rubber hand was aligned to the patient's midline, adopting the canonical position that their own left hand would occupy. The rubber hand's proximal end, held by the assisting experimenter, and the patient's left hand were hidden from the patient's view under a pillow. The 'ownership' of the rubber hand was tested as described below, the experimental procedure was explained to patients and they were then given two examples of each trial of the experiment (see below).

In 12 trials patients were instructed to slightly raise their left hand (self-generated movement condition) following a tap at a predetermined spot on the table in front of them (about 20 cm to the right of the rubber hand). In another 12 trials they were told to stay motionless and to anticipate that, following the tap, the assisting experimenter (seated at the left of the patient and holding the proximal end of the rubber hand under a pillow – see above) would passively lift the patient's left hand upwards for them (externally-generated movement condition). In a final set of 12 trials they were told to stay motionless following the tap and that the assisting experimenter would not attempt to move their left hand either (no-movement instruction condition). Self-generated movement, externally-generated movement and no-

movement instruction trials were presented in mixed, random order. For each of these levels of the variable Intention, the assisting experimenter was manipulating the rubber hand in two levels: movement (6 trials for each intention condition), or no movement (6 trials for each intention condition) (see Table 4.2). Movement and no-movement trials were presented in random order. Patients had to answer in each trial the movement detection, confidence, and movement agency questions described above.

The study's hypothesis hypothesis was that AHP patients would make more errors in their perception of rubber hand movement or non- movement in the self-generated movement condition, than in the externally-generated movement or no-movement instruction conditions.

Control and Ownership Baseline Questions

Control questions ("Please move your right hand upwards. Did your right hand move?") were asked before the experiment and every 10 trials to ensure patients were paying attention to and understanding properly the examiner's instructions. In addition, questions that verified that the patients believed their rubber-hand was their own were asked before, during (approximately every 8 trials), and after the experiment. These included the following questions: (1) Please point to your left hand using your right hand (while their left hand was hidden and the left rubber hand was placed in front of the patient); (2) Is this your hand? (pointing to the rubber-hand). Patients performed flawlessly on the right hand control task and the ownership control questions (i.e. they did not doubt the rubber hand was theirs), and therefore these results are not presented below.

It should also be noted that at the end of the experiment and while the participants' own left hand was out of sight, I tried placing the rubber-hand in positions incongruent to the canonical position of patients' own left hands. These included positions further to the left, to the right, and rotated rubber hand (180 degrees up-side down and back to front) positions. All patients (including the patient with a somatoparaphrenic delusion) denied ownership of the rubber-hand in all incongruent positions, replicating previous findings in healthy participants (Constantini & Haggard, 2007; Tsakiris & Haggard, 2005). As soon as the rubber hand was placed closer to the canonical position of the left hand and in the correct orientation (irrespective of where their own left hand was lying) patients stated that they thought the rubber hand was their own. In one of the control HP patients, I assessed whether this acquisition of ownership of the rubber-hand would apply even after I showed him the rubber-hand and explained the use I made of it during the experiment. After this briefing, the patient

spontaneously laughed and commented that I had 'tricked' him in believing that the rubber-hand was his own. However, when minutes later I presented the rubber-hand in the canonical position of his left arm as in the experiment and asked him if it was the rubber hand or his own, he once again stated the rubber hand was his own arm.

4.4. Results

4.4.1. Movement Detection

The HP (control) group showed overall high levels of correct responses, i.e. they responded 'yes' when the prosthetic hand moved and 'no' when it did not. The AHP group showed also a relatively high level of correct responses with one exception: a dramatic decrease in their correct responses in the case where they were told to move their left hand (self-generated movement) and there was no movement of the rubber hand. These results are depicted in Fig. 4.2.

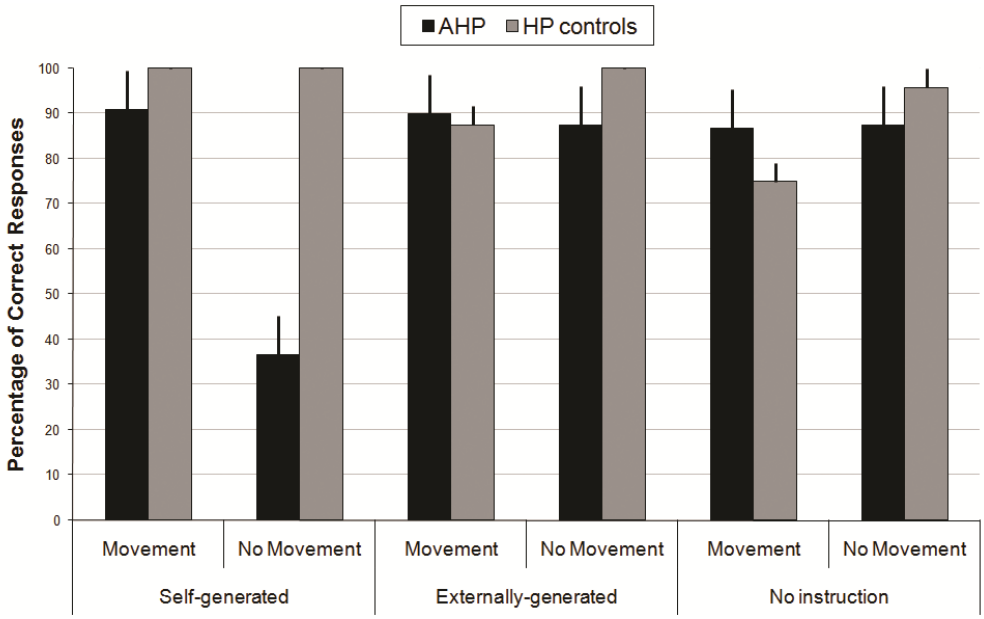


FIGURE. 4.2 Percentage of Correct Responses across groups (means and SEs) for 'Self-generated' (self-generated movement), 'Externally-generated' (externally-generated movement) and 'No instruction' (no movement instruction) Intention Conditions and for Rubber Hand Movement and No movement Conditions. Patients with AHP show a selective dramatic decrease of correct responses in the 'Self-generated/No Movement' condition.

Signal detection theory was applied to investigate differences between groups in the ability to detect movements of the rubber hand in each condition (Non-parametric analyses of total correct responses were also performed and confirmed the results of the analysis based on signal detection theory presented below). For this purpose, a hit was defined as the patient reporting a movement of their left hand when the prosthetic hand moved. A false alarm involved reporting movement when the prosthetic hand did not move. *D* prime values were calculated for each subject and each condition. Hit rates of 1.0 and false alarm rates of 0.0 were replaced by 0.99 and 0.01 respectively to allow *d* prime to be calculated despite floor and ceiling performance. *D* prime values in each condition were compared between the AHP and control groups, using Mann-Whitney tests. An alpha level of 0.017 was applied to correct for three comparisons. In the own-intention condition, *d* prime values were significantly lower for the AHP than the control group (median *d* prime 1.24 vs 4.65, U = 16, $p < 0.001$). The groups did not differ in sensitivity in the externally-applied and no-intention conditions (externally-applied, median *d* prime 3.03 vs 4.65, U = 10.5, p = 0.23; no-intention, median *d* prime 2.96 vs 2.54, p = 0.39). I conclude that the AHP group were impaired in detecting the movement of the rubber hand only in the condition where they had intended to move. Interestingly, the AHP group did not show a *general* impairment in perceptual sensitivity, since their *d* prime values were in fact higher than the control group in the no-intention condition.

4.4.2. Confidence scores

All patients showed high levels of confidence in their answers (see Fig. 4.3). A non-parametric Mann-Whitney test revealed an overall effect of group ($Z = 2.29$, $p < 0.05$) with AHP patients feeling less confident for their answers than the HP patients. A Wilcoxon Signed Rank Test showed that more confidence was shown overall in response to rubber hand movement than to non-movement conditions ($Z = 2.46$, $p < 0.05$). The interaction of group x movement was analysed by calculating the difference between confidence scores of movement and no movement and a non-parametric Mann-Whitney test showed that the group had a significant effect on this difference ($Z = 0.24$, $p < 0.05$), with AHP patients showing less confidence than HP patients in their answers to No-movement than to Movement conditions. There were no other observed differences.

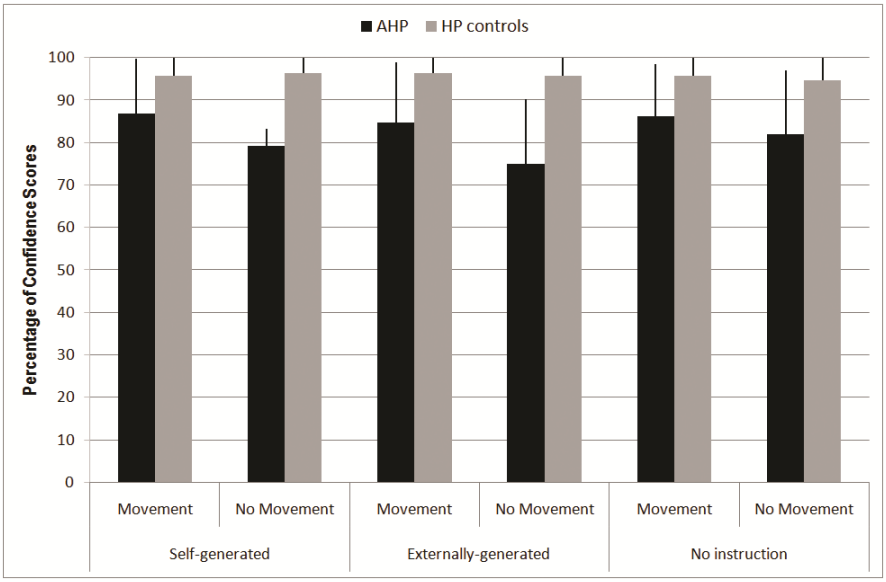


FIGURE. 4.3. Percentage of Confidence Scores across groups (means and SEs) for 'Self-generated' (self-generated movement), 'Externally-generated' (externally-generated movement) and 'No instruction' (no movement instruction) Intention Conditions and for Rubber Hand Movement and No movement Conditions.

4.4.3. Agency Questions

The extent to which patients experienced agency over the movement of the hand was assessed by asking them "Did you or someone else move this hand?" in each trial. The anosognosic patient who also showed somatoparaphrenia in spontaneous behaviour (see A2 in Fig. 4.1) found this question very challenging and either remained quiet when asked or, stated she did not know. The question was discontinued after 6-7 trials as she appeared to get considerably upset by it. Two of the three remaining AHP patients stated that they had performed the movement in all of the 'self-generated movement' trials that they had 'perceived' a movement, even if the rubber hand had in fact remained motionless. The fourth patient experienced agency in all of the 'self-generated movement' trials in which he had 'perceived' a movement, except in one of the four trials in which he had 'perceived' a movement but the rubber hand had in fact remained motionless. In the 'externally-generated movement' and 'no movement' conditions, these three anosognosic patients denied agency of the movement.

All control patients denied agency of movement in all the 'externally-generated movement' and 'no movement instruction' trials in which they had perceived a movement. However, to our surprise three out of four of the HP control subjects stated that they had performed the movement in all of the 'self-generated movement' trials that the rubber hand moved. Given that these patients were not anosognosic in spontaneous behaviour and in formal assessment (see Table 4.1), I asked them the following questions after the completion of the experiment: what made them believe they had moved their left hand, whether they had moved it at all during their hospitalisation and, if not, and what allowed them to move it now. All three patients answered that they had not moved their left hand at all since the stroke, they could not explain why they were able to do so during the experiment, and they based their answers mostly on what they saw but also to an extent on an 'internal feeling of having moved it' during some of the trials. Characteristically, one subject also commented: "Sometimes I had the impression that even if I had closed my eyes I would feel it move. I mean I felt the movement in my hand. I didn't just see it". None of the patients had recovered any of their left arm motor power at the time of the experiment. Unfortunately, due to practical constraints, such interesting and unexpected observations could not be further explored in the present thesis. Their implications and suggestions for future studies are discussed below.

4.5. Discussion

4.5.1. Summary and Implications for Neurocognitive Theories

In this section, I will first discuss the results of this study in the content of the neurocognitive literature to which they epistemologically and methodologically relate, before I go on to discuss their implications for existential theory and counselling psychology. In order to investigate the role of motor intention in AHP, this study provided patients with and without AHP substituted visual feedback of movement in their left paralysed upper limb. Thus the study was able to assess whether their ability to visually detect this substituted movement varied according to whether patients had planned to move their limb or not. The results showed that all patients, including patients who were aware of their hemiplegia, believed that they generated movements when they were presented with visual feedback of a moving prosthetic hand that they thought was their own. Crucially, motor intention had a selective effect on

patients with AHP; they systematically disregarded visual information of a motionless rubber hand on trials where they had the intention to move, compared to trails where they expected the experimenter to move the rubber hand, or when there was no expectation of movement. In other terms, patients with AHP were unable to detect absence of movement correctly in the self-generated condition, but were able to detect it in the externally-generated condition. By contrast, patients without AHP were not influenced by these manipulations and they did not claim that they had moved their hand when the rubber hand had remained still.

These results confirm that AHP is influenced by motor planning, and in particular that motor 'awareness' in AHP derives from the processing of motor intentions. This finding is consistent with the proposals made by Frith et al. (2000; see also Berti *et al.,* 2007) that the illusory 'awareness' of movement in anosognosic patients is created on the basis of operations able to predict the positions of the limbs given certain motor intentions, and not on the basis of a comparison between the predicted and actual sensory feedback, which seems to be malfunctioning. According to this hypothesis, patients with AHP are able to form appropriate representations of the desired and predicted positions of the limb. However, conflicting information derived from sensory feedback that would indicate a failure of movement is not normally available, because of brain damage to regions that would register the actual state of the limbs, or else because this contrary information is neglected. A recent lesion mapping study suggested that premotor areas BA6 and 44, which are implicated in action monitoring, are the most frequently damaged areas in patients with AHP (Berti et al., 2005; but see previous chapter). This finding may explain why these patients fail to register their inability to move, but it does not address the functional mechanism that underpins their illusory awareness of action per se, as opposed to the prereflective aspects of body knowledge (see previous chapter). The current results instead provide direct evidence for the hypothesis that non-veridical awareness of action (thinking that an intended movement has taken place when no such movement has been performed) is based on the stream of motor commands and not on sensory inflow.

Patients with AHP have diverse somatosensory deficits. Therefore, assessing the exact role of sensory feedback on AHP can be challenging. To resolve this problem, this study substituted visual feedback from a prosthetic hand which patients believed was their own, for somatosensory feedback from the patient's own hand. Accordingly, I predicted that the detection of the patient's movement based on this substitute feedback depended on their motor intention. Thus, patients' errors were unrelated to proprioceptive sensory feedback. Crucially,

visual information showing a lack of movement was selectively ignored when the patients were instructed to generate themselves the feedforward motor signals to move. To the best of my knowledge, this study is the first to test directly the hypothesis of dominant motor intention in AHP patients. Interestingly, accumulating evidence suggests that even neurologically healthy people demonstrate a remarkably limited awareness of actual movements and their sensory feedback (e.g. Fourneret & Jeannerod, 1998). In fact, it is only when the discrepancy between predicted and actual consequences exceeds a certain threshold that we become aware of an error signal from the comparator. On that view, AHP may represent an exaggerated form of the normal function of the internal models of the motor system.

Could this result be explained by alternative accounts of AHP? The selective deficit that AHP patients showed in this experiment cannot be accounted for by the proposal that AHP results from a lack of motor intention (Heilman et al., 1998). That hypothesis does explain the clinical observation that patients cannot 'discover' their impairment, but it is not sufficient to explain why patients may claim that they have moved when actually they have not (see also Frith et al., 2000 and Berti et al. 2007 for discussion).

Nor can the observed results simply be a confounding effect of contralesional neglect. Even though our anosognosic group did show higher neglect scores than non-anosognosic patients with similar lesions and motor deficits, patients did perceive the lack of movement in the externally-generated movement and no-movement instruction conditions, and they showed only a selective difference for self-generated movement. This suggests that neglect cannot be the primary cause of the anosognosic errors performed by our AHP patients (see also Bisiach et al., 1986; Marcel et al., 2004 for dissociations between AHP and neglect).

It is also unlikely that the observed results reflect a general deficit in detecting abnormalities and contradictions (Ramachandran, 1995), or a greater suggestibility, because AHP patients were able to detect the similar discrepancies between instruction and no rubber hand movement in the externally-generated movement conditions. In addition, our patient groups were well matched in terms of cognitive deficits, such as confusion or intellectual impairment ruling out a general cognitive deficit explanation (Levine et al., 1991).

Interestingly, a number of investigators have suggested that emotional factors may influence AHP and explain some of its delusional elements (Marcel et al., 2004; Vuilleumier, 2004; Turnbull et al., 2005). These emotional factors could be directly linked to the aetiology of anosognosia, rather than being secondary (psychogenic) consequences as previously

suggested (Weinstein & Kahn, 1955). For example, some have suggested that AHP may result from abnormal affective regulation (Nadrone et al., 2008; Turnbull et al., 2005). Alternatively, other have claimed that right brain damage may alter emotional and attitudinal processes implicated in self-attribution of perceptual experiences (Marcel et al., 2004), or, cause spatial deficits that undermine the representation of self-other separateness (Solms, 1999; Feinberg et al., 2005). Sadly, it was not possible to test these possibilities directly in the present thesis, although it is of course possible that the emotional relevance of the self-generated movement condition (and the relevant noted feelings of agency of movement) was higher than that of the externally-generated movement trials. Future studies should explore these possibilities directly.

Additional Findings

Two further findings merit discussion. First, hemiplegic and hemianeasthetic patients, with and without AHP, accepted a rubber hand as their own if it was placed at a canonical position. The attribution of ownership of the rubber hand points to the fragility of our ownership judgements and is relevant to studies of the 'rubber-hand illusion' in healthy volunteers (Botvinick & Cohen, 1998). These experiments have demonstrated that the sense of body ownership can be disrupted in normal volunteers by showing them a rubber arm that is seen to be stroked exactly in time with tactile stroking of their real arm. Furthermore, movements of the real arm may become inaccurate because the volunteers assume the starting position of their arm is that of the rubber arm. Given the patients' severely impaired proprioception and tactile sensation, I anticipated that visual feedback of a realistic rubber hand in the canonical position could make them unusually ready to attribute the rubber hand to themselves. Indeed, the results showed that patients were willing to accept a rubber hand as theirs when placed in the canonical position and they did not doubt the ownership of the rubber hand throughout the experiment. Furthermore, one of our patients was somatoparaphrenic in spontaneous behaviour (patient A2 claimed that her own left hand was her husband's) but she did accept the rubber hand as hers when it was placed in the canonical position of her own left hand and her own left hand was out of sight.

Frith (2005) has speculated that patients with asomatognosia or somatoparaphrenia think that the hand they see is not their own hand because it is in a different place from where they know and expect their own hand to be. Indeed, this study found that patients only self-attributed the rubber hand when it appeared in the position they expected their own left hand to be. Previous studies in healthy volunteers have shown that passive visual exposure to artificial hands in a congruent posture induces a visual recalibration of proprioception of the

participant's real hand position toward the position of the artificial hand (Holmes et al., 2006). However, simply viewing an artificial hand does not create a strong illusion of ownership in healthy participants. For that, synchronized visual and tactile experience is required, as in the rubber hand illusion. Our patients' tactile and proprioceptive deficit may have made them unusually willing to accept merely visual evidence of ownership.

A second interesting observation concerns our control group. Patients with hemiplegia but no AHP believed they had moved their plegic arm in conditions of self-generated movement/rubber hand movement. In other words, when they were asked to move their left arm and an experimenter was moving the rubber hand congruently with the instructions but unbeknownst to them, the majority of our control patients claimed they had moved their arm themselves (unlike the AHP patients who believed they had moved even when the rubber hand was motionless). Remarkably, these patients were fully and simultaneously aware of their paralysis. This misattribution of the agency of rubber hand movement highlights both how patients' beliefs may be altered by experimental manipulations, and the roles of both vision and motor intention in these belief formations. The effects of illusory visual feedback on action recognition have been similarly explored using mirrors (Ramachandran, 1995) and video projections (Daprati et al., 1997; Sirigu et al., 1999). Sirigu and colleagues (1999) showed that incongruent visual feedback can lead apraxic patients with left parietal lesions to falsely believe they have performed normal instead of inaccurate movements. Interestingly, in the same study, when healthy control participants received visual feedback of the examiner's hand performing the same simple action they were instructed to perform (simultaneous and congruent visual feedback), their performance in distinguishing between the visual image of their hand and that of the examiner's was not significantly better than that of the parietal patients. This difference became significant only when complex actions were tested. These observations suggest that the match between intention and visual feedback is important in self-attribution of action.

Finally, the possibility of an effect of suggestibility should be taken into account in both of these observations, but it should also be noted that both were selective and thus could not fully be accounted for by suggestibility. Patients did not accept the rubber hand as theirs when it was placed in non-canonical positions and control patients did not report being able to move their paralysed arms when they received contrary visual feedback.

4.5.2. Implications for Existential-Phenomenological Theory

This section will explore how the present findings can be understood from the point of view of the existential-phenomenological perspective that Merleau-Ponty has put forward in his writings on anosognosia and embodiment more generally. In considering such perspective, I will also endeavour to discuss points of similarity and disagreement with some of the theories put forward to explain AHP in the cognitive literature, as outlined above.

As I discussed in the introductory section of the present chapter, a central point in Merleau-Ponty's analysis of AHP concerns the observation that the prereflective, nonthematic appreciation of a threat or limitation to the body's habitual motor potentialities, can go hand in hand with an abstracted, conscious perception of the body as able and as non-paralysed. This observation leads to the empirical prediction that AHP should be paradoxically most observable during conditions that call upon such motor potentialities. The empirical study undertaken in this chapter, operationalized and tested this hypothesis by creating, experimentally controlled conditions in which patient had to detect hand movement following self-initiated (active) versus other-initiated (passive) movement expectations. Within such specific context, the study confirmed the hypothesis in question, in the sense that errors in detecting movement were significantly more frequent when patients were asked to try to perform a movement than when they were told that their hands would be moved passively or not at all.

These findings raise the question of whether they could be legitimately considered as an empirical confirmation of Merleau-Ponty's existential-phenomenological reflections, even as mere scientific approximations to the totality of the individual's lived body. As I reviewed above, these findings are compatible with contemporary neurocomputation models of motor control. These make a number of assumptions that may not be compatible with an existential-phenomenological perspective on embodiment, such as the concepts of 'forward models' and 'comparators'. Although such cognitive operations are thought of as operating at the unconscious level, they nevertheless are conceived by at least some authors as 'representational' in content and 'modular' in structure, i.e. neurochemical processes taking place in specific, specialised and proximal areas in the brain that replicate some relations and principles at the periphery of the organism (Frith et al., 2000; Berti et al., 2005). Indeed, Merleau-Ponty's perspective is regarded by most scholars as paradigmatically anti-representationalist (e.g., Dreyfus, 2002; Gallagher, 2008: 360-64).

Of course, even within the traditions that most relate to Merleau-Ponty's perspective on such matters, namely embodied cognition and enactivism, there are ongoing debates on the nature and role of the concept of 'representations', with some theorists allowing revised concepts of representation to be retained (e.g. Clark, 1998) and others arguing for a total rejection of the potential usefulness of such concepts (Hutto & Myin, 2013). These debates lie beyond the scope of the present thesis. Nevertheless, the emphasis of the above neurocomputational models on the idea that unconscious motor potentialities are present in perceptual experience and ultimately influence motor awareness (Jeannerod, 2006), on which the current study was built on, seem compatible with the perspective that Merleau-Ponty has drawn regarding human embodiment and the role of opportunities for action in perceptual experience (see also Berendzen, 2014 for an extensive discussion on this similarity). Moreover, although some of the language used by cognitive neuroscientists such as 'motor intentions' or 'motor planning', as outlined above, may suggest that these models imply a kind of conscious and potentially propositional 'planning' stage that precedes and determines action. Such a view would be in striking contrast with Merleau-Ponty's views on action that stress the habitual, non-reflexive view of action and explicitly reject the idea of conscious action plans (1945/1962; p. 159-161). In his account, humans have integrated sets of skills ready to anticipate and incorporate a world prior to the formation of thoughts and the application of any concepts. This kind of embodied poise, which Merleau-Ponty calls "habit," constitutes our nonthematic, preconceptual "motor intentionality" (1945/1962; pp. 127). A close reading of the aforementioned neurocognitive models however, conveys similarities with this view, at least as described by the neuroscientific developers of such models (Blakemore et al., 2000), some neurophenomenologists (e.g. Berendzen, 2014) and perhaps less so by the cognitive scientists that apply them to psychological phenomena (Frith et al., 2000; Berti et al., 2005). These models were not primarily developed to explain conscious motor processes but rather unconscious motor control. Thus, words 'motor intentions', 'motor planning' or 'forward models' are used to describe unconscious brain processes of motor preparedness and potentiality and not cognitive modules, nor contents of awareness. These models put forward the idea that prior to any reflective thought, or perceptual content, the body is capable of monitoring its own action, based on prior experience and such unconscious, motor control processes that are simultaneously the first ingredients of perception, including the perception of one's own body. This view seems compatible with Merleau-Ponty's idea that "it is the body that 'understands' in the acquisition of habit" (1945/1962; pp. 167).

I believe that in this light, the current study showed not how conscious intentions or expectations of movement lead to anosognosic errors, but rather how these experimental instructions and the patient's conscious wish to follow them, elicit the body's habitual motor preparedness and potentiality, which in itself ultimately influences patients' non-veridical awareness. Specifically, it is the patient's prior commitment to her own body and the world as the body itself 'knows' it tacitly, habitually and practically that seems unaffected in these patients (see also previous chapter) and may drive them to deny one's paralysis in abstract, propositional, reflective terms, particularly in the context of a lesion that may have affected such of the cognitive, conceptual tools that people have to create such perceptual abstractions. The patients are thus able to remain tacitly open all their habitual possibilities and their attempt to perform a movement as the body expects to be able to do so exposes them to the risk of encountering limitations in such possibilities. In order to maintain their habitual commitment to the world, the detection of this risk prereflectively is not translated into conscious reflection, which in itself may also be directly affected by the brain damage in question and may be harder than usual to update. Instead, the conscious appreciation of the body remains 'safe' as a more general, in this case, illusory abstraction of the here-and-now of practical, embodied experience. From this general, abstracted perspective, the body of the anosognosic patient, i.e. as an object of conscious perception and not as the subjectively lived body, is able to move in the moment, as it is able to move always.

4.5.3. Implications for Existential Counselling Psychology and Psychotherapy

As mentioned in the introduction and the previous chapter, the consideration of AHP from this interdisciplinary perspective may be of relevance to existential, psychotherapeutic considerations regarding anosognosic patients, as well as more generally to the kind of paradoxes encountered in psychotherapeutic practice regarding self-awareness, and particularly the tension between our habitual ways of being-in-the-world and our conscious wish to change our habits. I believe the results of the present experiment further highlight the challenges faced by the existential counselling psychologist, or psychotherapist in their potential attempts to respond to the needs of anosognosic patients, as well as to any client who presents with issues regarding the human paradox of self-awareness. Specifically, the present findings highlight how an existential therapist needs to be attuned not only to the conscious

content, agency and wishes of their clients but also to their more general, embodied commitment to the world and their 'embodied intentionality'. As discussed in the previous chapter, despite their conscious unawareness of their paralysis, these patients may be simultaneously and tacitly aware of the threat to their motor potentialities. The present chapter confirms that this tacit knowledge of one's deficit is paradoxically intertwined with their conscious inability to perceive their deficits. The more a patient's body wishes to move, the more objects, or spatial configurations in the room call upon the body of the anosognosic for habitual models of action, the less aware the patient will be of their inability to execute such actions.

Although this insight, generated by third-person, philosophical reflection and confirmed by tthird-person, scientific experimentation, cannot be taken for granted in every client, and needs to be considered as a possibility rather than a certainty in each case, it may be a useful reminder of the paradoxical nature of embodied, self-awareness and a platform from which the embodied aspects of the setting of psychotherapy can be considered. First, patients request to see a psychotherapist, despite their explicit and at times forceful denial of the need for any other 'physical' or medical therapy, can itself provide a useful topic for reflection, exploration and horizontalisation (see previous Chapter). While their conscious denial of any need for bodily help is axiomatic in anosognosia, their potential ability to acknowledge their need for psychological, intersubjective support during this bewildering and challenging period and their explicit request of such support, may open up the door to exploration of their potential, parallel acknowledgement that there is a deficit, or challenge of psychological nature that needs to be addressed. Moreover, existential psychotherapy, like most psychotherapies, relies mainly on verbal exchanges; action is implicated mainly as a means of social communication (e.g. speech, gestures, postures, facial expressions), rather than as part of any therapeutic act (e.g. unlike in occupational therapy when patients are asked to perform certain practical tasks such as cooking). From the perspective of the present findings, this may constitute a rather unique, opportunity for the patient not to have her motor potentialities challenged to a high degree. Instead, the patient may be able to consciously explore changes in their body in abstract terms and in an 'off-line' mode. As discussed above, such conscious, reflective terms would also be enslaved to the primacy of prereflective experience of the body, yet consistent with the hypothesis and findings of the present study, the smaller the calling of the world for action, presumably also including the intersubjective world, the less the exposure of the patient to the prereflective knowledge of their deficit. It may thus be that within the constraints of the

intersubjective, mostly verbal, 'off-line' and reflective context of existential psychotherapy, these patients may find it relatively easier to reflect on their deficits in abstract terms, before they become ready to drastically renegotiate their embodied commitment to the world.

Of course, the above distinction between the 'verbal, reflective' psychotherapeutic setting and the 'prereflective, embodied' world of on-line action is arbitrary. As I have discussed throughout this thesis, the totality of our experience of the body in the world entails a deep interdependence between such 'on-line' and 'off-line' facets of experience. However, to the degree that Merleau-Ponty's hypothesis regarding the role of prereflectively threatened motor potentialities in anosognosia is confirmed by the findings of this and the previous chapter, one could formulate the reverse empirical prediction of obvious psychotherapeutic value. Namely, the less such motor potentialities are called for in an encounter with an anosognosic patient, the smaller should the anosognosic errors be in conscious perception. This of course raises the challenge of how could an encounter minimise its embodied calling for action, while at the same time afford the patient the opportunity to consciously reflect on their own action potential. This challenge is precisely what I will endeavour to address in the single case study of the following chapter, with the help of simple technology, namely video recordings and play-back.

4.5.4. Summary and Conclusion

This chapter tested the hypothesis that AHP involves the dominance of one's prereflective motor habits over sensory feedback in the awareness of action and have produced experimental evidence in support of this hypothesis. Specifically, I found that patients with AHP are more likely to falsely detect movement of their plegic arm when they have the intention to move it, than when movements are externally-generated or when no movement is anticipated. I have interpreted these findings according to both a neurocomputational model of motor control, as well as the existential-phenomenological perspective of Merleau-Ponty on anosognosia and embodiment more generally. Despite their differences, both of these views suggest that the non-veridical, conscious awareness of action in AHP is formed on the basis of intact unconscious predictions regarding the motor potentiality of the body. In AHP these are not appropriately constrained by sensory information about the actual position of the limbs and other regulatory cognitive operations. While previous studies have suggested that conflicting sensory information may not capable of altering anosognosic beliefs (Berti et al., 2005), they

did not demonstrate that sensory feedback about the affected limb was ignored even when it was demonstrably available. Accordingly, this study demonstrated for the first time why anosognosic beliefs are formed in the first place: the altered awareness of action in AHP depends predominantly on our habitual awareness of the body as able. Other studies have shown that actual sensory feedback has a remarkably limited role in the experience of action in neurologically healthy individuals (Sarrazin et al., 2008). To this extent, in agreement with Merleau-Ponty insights, AHP may be a pathological exaggeration of the dominance of pro-active signals over conscious reflections on the body. Finally, I discussed the implications of these findings for existential, psychotherapeutic considerations and particularly the mostly verbal, 'off-line' setting of all psychotherapy. The later considerations brought us to the hypothesis to be tested in the next chapter, namely, the less such motor potentialities are called for in an encounter with an anosognosic patient, the smaller should the anosognosic errors be in conscious perception.

5. Video-replay Reverses Anosognosia: Off-line, Third-Person Awareness

5.1. Summary of Chapter

This chapter presents a patient with severe anosognosia for hemiplegia, whose anosognosia was unaltered when she observed her plegic arm in her ipsilateral visual field (self-observation from a first-person perspective). However, the patient recovered instantly and permanently when viewing herself in a video replay and given the opportunity to discuss her self-observation with a non-judgemental researcher. Following up from the findings of the previous chapters, it is possible that the observed dramatic reinstatement of awareness relates to the observation of oneself 'offline', i.e. at the time when one was not intending to move and 'from the outside' (third-person perspective). To the best of my knowledge, the role of off-line, third-person self-observation has not been assessed in AHP to date. Thus, this case study provides preliminary evidence that when right hemisphere damage impairs the ability to update one's body representation, judgements relying on off-line, self-observation and possibly also self-observation from a third-person perspective may be spared in some patients and may provide facilitating visual feedback to first-person awareness. This conclusion is consistent with Merleau-Ponty's ideas regarding the dependency of explicit self-awareness on implicit, motor potentialities, as well as his views regarding the constitution of the self, based on both first- and third-person perspectives.

5.2. Introduction

As reviewed in the Introduction and experimentally shown in the previous two chapters, a central point in Merleau-Ponty's analysis of AHP concerns the observation that patients with anosognosia show 'preconscious knowledge' (1945/1962; p. 93) of their paralysis (see Chapter 3). Moreover, according to this view and contrary to cognitive theories on such phenomena, the denial of one's motor deficits does not exist despite one's pre-reflective, non-thematic understanding of the same deficits, but rather because of it. Specifically, it is precisely the risk of losing one's habitual motor potentialities and more generally one's commitment to the world as the body itself 'knows' it tacitly, habitually and practically that necessitates the denial of one's paralysis in a more abstract, reflective terms. Thus, patients' non-veridical awareness of movement, i.e. their anosognosia and related illusions of movement in the plegic arm, seem to stem from the dominance of such habitual motor potentialities over sensory information about the actual effects of movement. The previous chapter confirmed the related empirical hypothesis that the greater the elicitation of such motor potentialities by the environment (the experimental conditions in this case), the larger are the errors in the conscious perception of the body as active. These findings suggest that for as long as patients have the intention to move, they are likely to build their more abstract, explicit self-awareness based on such habitual motor potentialities and thus falsely believe that they have moved in the moment and that they can move more generally. However, the reverse hypothesis remains untested. Namely, could instances during which the motor potentialities of the body of an anosognosic patient are not called upon by the situation, lead them to develop greater explicit awareness regarding their paralysis?

Importantly if confirmed, the above hypothesis may have implications for the treatment of anosognosia at the acute stage of recovery. As reviewed in the Introduction, AHP typically remits over time as a result of spontaneous recovery, but sometimes patients remain unaware also in the chronic stage (see Pia et al., 2004 for review). Moreover, the presence of AHP in the acute stage may significantly obstruct rehabilitation efforts and consequently impede long-term functional outcomes (Gialanella et al., 2005; Jehkonen et al., 2006). As outlined in the introduction, there have been recent advances in the management of AHP by providing specific rehabilitation guidelines and strategies (see Prigatano & Morrone-Strupinsky, 2010 and Jenkinson et al., 2011 for reviews), with temporary remission of AHP also being recently reported using a combination of techniques (see Beschin et al., 2012). Unfortunately, despite

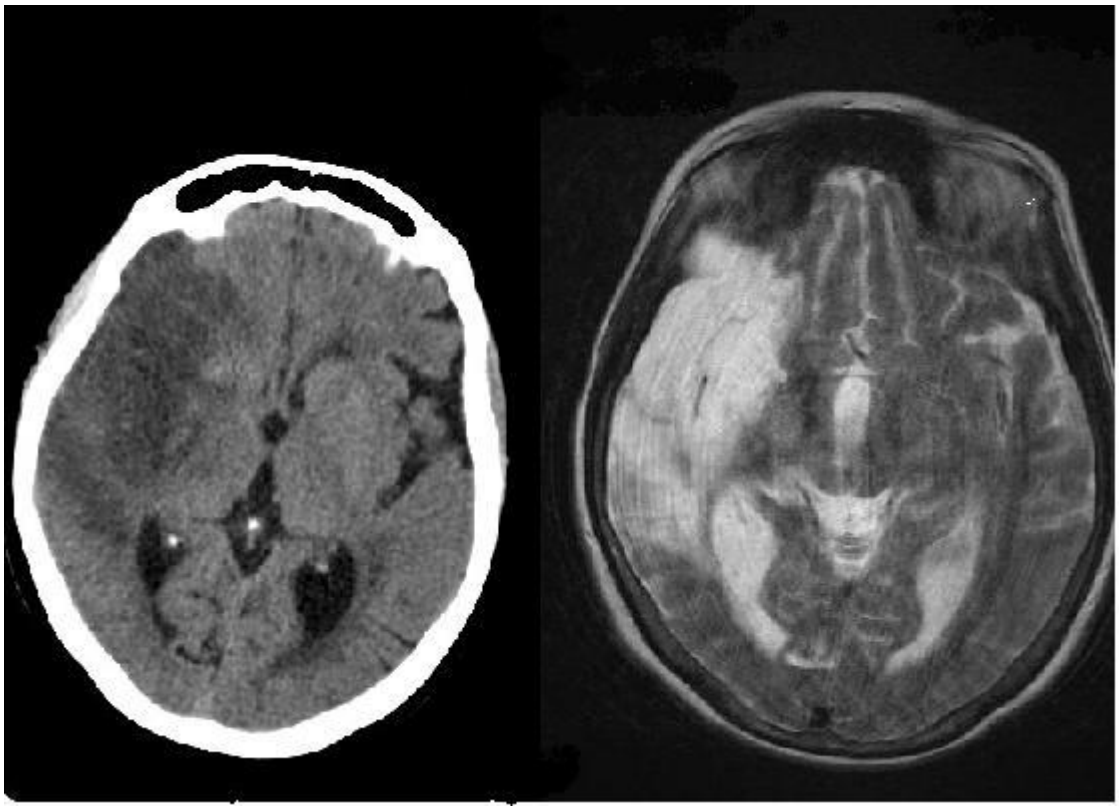
these rehabilitation efforts, there is currently no known, efficacious intervention for permanent restoration of motor awareness in patients with AHP (Kortte & Hills, 2011; Jenkinson et al., 2011).

Can however, the insights generated by the existential perspectives and experimental findings of the previous chapters be used to design a specific sensorimotor intervention for the treatment of AHP? How can one help patients become aware of their motor failures when attempting to move, without allowing their motor intentions to influence their motor awareness? One possibility would be to film patients while attempting to move and then at a subsequent point in time use such video-clips to provide video-based feedback of motor failures. Under these conditions, when patients are observing themselves in the video replay trying to move, they are resting and hence not experiencing motor intentions in that particular moment in time. Instead, such intentions were formed during the actual filming. This 'off-line' character of video-based feedback may thus facilitate 'off-line' motor awareness. However, to my knowledge, off-line self-observation has not been used for the treatment of AHP to date. This chapter presents a patient with anosognosia, who recovered instantly and permanently from her anosognosia when viewing herself in a video replay.

5.3. Case Report and Methods

LM was recruited and tested according to the inclusion and exclusion criteria, and Ethical principles, specified in Chapter 2. She was the only patient from the group of patients recruited in Chapters 2 and 3 that was able to take part in a rehabilitation study, as there had been practical difficulties in her transfer and re-housing and she stayed in hospital for a longer period. She was a 67-year-old right-handed woman with 15 years of education (Premorbid IQ 114, as estimated by the Wechsler Test of Adult Reading), at the time a retired publisher. She was previously mobile and independent with no relevant medical history, other than untreated hypertension. She was single and lived alone, leading a relatively busy social life of many philanthropic activities. Fig. 5.1 shows LM's scans one day and one-year post-onset. The study was approved by the local NHS ethical committee and LM gave written informed consent (see Chapter 2 for details), including to the unique aspects of this case study such as the filming and subsequent video viewing of herself.

FIGURE 5.1. Left: Computerised tomography (CT), one-day post-onset. Neuroradiological report: R MCA hyperdense area, R frontoparietal MCA region, effacement of R lateral ventricle. Right Magnetic Resonance Imaging (MRI), one-year post-onset. Neuroradiological report: Extensive area of mature damage, involving predominately the right frontotemporal region, with some involvement of the adjacent parietal lobe to a lesser degree. There is extensive volume loss of the deep grey matter structures also on this side. Appearances are consistent with a mature right MCA infarct.



5.3.1. Nature of LM's Anosognosia for Hemiplegia

The Berti et al. awareness interview (1996) (see Chapter 2), as well as a set of ten bi-manual, five bi–pedal and five, control uni-manual questions designed specifically for assessing anosognosic patients (Marcel et al., 2004) were used to assess LM's anosognosia in different time points before and after the video intervention. At baseline, LM showed unawareness of her general condition and she even claimed she had performed certain of the requested tasks with her left plegic arm (see Table 5.1 for full scores; see also Chapter 4 for methodological details of this assessment). The diagnosis of anosognosia for hemiplegia was confirmed by neurological reports and the wider, interdisciplinary team responsible for her care. The diagnosis was also consistent with observations that LM's relatives and friends made when visiting her at the hospital, e.g. "It is as though she cannot understand she had a stroke, not really. She thinks she can walk and come out with us as before".

During the first 22 days post-onset, LM became gradually aware that she had had a stroke and often stated that her left-side was 'weaker than the right'. Nevertheless, during this time, she never showed any acknowledgement of her upper limb paralysis and she repeatedly attempted to stand and perform bi-manual tasks. Placing her left arm in her right visual field (i.e. overcoming her visuospatial neglect) and asking her to move it had no effect on her anosognosic responses. She was evidently frustrated with hospital staff when they did not allow her to stand or her own and claimed that she could go to the bathroom, or indeed outside the hospital, unaided. She blamed the 'extreme health and safety' culture of the hospital for all the constraints on her mobility. In addition, she rated herself accordingly in questions that directly addressed her ability to perform bi-manual tasks such as clapping hands (Marcel et al., 2004) (see Table 5.1). This pattern of behaviour is consistent with previously reported dissociations between being generally aware of one's condition and being unaware of specific motor failures and vice versa (Marcel et al., 2004). She was somewhat more aware of her left leg weakness and on questioning she was less anosognosic about her abilities to perform bi-pedal tasks such as walking (see Table 5.1). Similar variation in awareness between upper and lower limbs has been previously reported (e.g. Berti et al., 1996). She also showed spontaneous confabulations (false memories) that included claims of performing both bi-manual and bi-pedal tasks during her hospitalisation, such as walking around the ward, washing and dressing herself without any assistance. She became increasingly frustrated with hospital staff and all the 'limitations they

have imposed on her' and she was frequently expressing her dissatisfaction. She participated in most therapeutic efforts in the ward but staff noted her lack of motivation during sessions. Nevertheless, some verbal replies suggested tacit awareness of her deficits; during a ward round she consented to junior doctors observing her assessment by the physiotherapist, during which she was anosognosic. However, as the junior doctors were about to leave she spontaneously told them: "Perhaps it would be really useful to you to come and see me at a time that I'll be really ill and unable to move".

5.3.2. Neurological and Neuropsychological Assessment.

Her neurological and her neuropsychological profile are presented on Table 5.1. She was assessed using the standardised neuropsychological tests described in Chapter 2, with the following modifications: Postmorbid intelligence was assessed using the following WAIS-III (Wechsler, 1998) subtests: Vocabulary, Similarities, Digit Span, Arithmetic, Matrix Reasoning). Verbal short- and long-term memory was assessed the Wechsler Memory Scale - 3rd Edition (WMS-III; Wechsler, 1998). Short-Subtests of the RASP were used for the measurement of sensory functions: 'Surface Touch', 'Tactile Extinction' and 'Proprioception'. Reasoning abilities were assessed using the Cognitive Estimates Test (Shallice and Evans, 1978) and the DK-EFS Proverbs Test (Delis, Kaplan & Kramer, 2001) and inhibition of automatic responses was assessed with the Hayling Test (Burgess & Shallice, 1997).

Table 5.1. LM's neurological and neuropsychological profile

Pathology	Large R distal MCA infarct. Onset: Found collapsed, L hemiplegia Carotid dopplers: minor atherosclerosis both internal carotid arteries (30%)
Awareness Testing	*Awareness Interview*[6] **6 days post-onset**: LUL 2 / LLL1 (anosognosia) ^ ^[1]Bi-manual: 6 (SD 1.3); Bi-pedal: 1.6 (SD 1.3) Uni-manual: 7.4 (SD 1.1) **15 days post-onset:** LUL 2/ LLL1 (anosognosia) **22 days post-onset:** (pre-video): LUL 2 / LLL1 (anosognosia) ^[1]Bi-manual: 5.8 (SD 0.9); Bi-pedal: 1.3 (SD 0.5) Uni-manual: 6.2 (SD 0.8) **22 days post-onset:** (post-video): LUL 0 / LLL 0 (awareness) ^[1]Bi-manual: 2.4 (SD 0.8); Bi-pedal: 1 (SD 0) Uni-manual: 6.2 (SD 0.8) **36 days and 6 months post-onset**: LUL 0 / LLL 0 (awareness) **6 months post-onset:** ^[1]Bi-manual: 1.8 (SD 0.4); Bi-pedal: 1 (SD 0) Uni-manual: 7.4 (SD 0.6)

Neurological Assessment	***6 days post-onset:*** GCS = 15. *L side:* Hypotonic; Reflexes absent; No sensation; No pain; 0/5 power; Mild Dysarthria. L lower facial weakness; L neglect; L homonymous hemianopia; R Gaze Deviation. Visual Fields¥: R 9/ 10 L 2/10 Both 0/10 RASP∞ (Impaired): Surface Touch: L 5/30. Tactile Extinction: 0/12. Proprioception: 9/30. ***22 days post-onset*** *(pre-video):* Hypertonic. Unaltered: LUL power, sensation, neglect. Mildly-improved: Dysarthria and R Gaze deviation, LLL power. RASP (Impaired): Surface Touch: 4/30. Tactile Extinction: 1/12. Proprioception: 7/30
Neuropsych¤. Assessment	***6 days post-onset :*** *Intelligence: Normal in WAIS-III¤1 Verbal Subtests; Some impairment in Performance subtests:* Verbal IQ: 111 Matrix Reasoning: SS = 4; Block Design: SS= 2; Picture Completion: SS = 8. *Verbal Reasoning:* Proverbs¤2 12 (within 1SD above average). Cognitive Estimates¤3 6 (normal range 2-6). *New Learning:* WMS-III¤4 Logical Memory: Immediate SS = 10. Delayed SS = 10 (average scores). *Visuospatial Processing: Marked Personal and Extrapersonal Neglect: BIT¤5* Total Score: 68/146. Comb/Razor Test¤6: 24 R/4 L/5 Ambiguous. One-item Test¤7 1 = the left hand is reached with hesitation and search ***22 days post-onset:*** *Unaltered Personal and Extrapersonal Neglect. BIT* Total Score: 72/146. One-item Test: 1

*WTAR = Wechsler Test of Adult Reading (Wechsler, 2001);
^Awareness Interview (Berti et al., 1996). ^1 Actions Awareness Questions (Marcel et al., 2004): Scale not at al = 0 – 10 As well as before. Scores > 5 represent overestimation in each bi-manual and bi-pedal task.
∞RASP = The Rivermead Assessment of Somatosensory Performance (Winward, Halligan & Wade, 2002).
¥Visual-fields were tested with the customary 'confrontation' technique (Bisiach et al., 1986).
¤Neuropsych. = Neuropsychological. ¤1WAIS-III = Wechsler Adult Intelligence Scale- 3rd Edition (Wechsler, 1998). ¤2Proverbs = Delis Kaplan Executive Functions System (Delis, Kaplan & Kramer, 2001); ¤3Cognitive Estimates = Cognitive Estimates Test (Shallice and Evans, 1978). ¤4WMS-III = Wechsler Memory Scale- 3rd Edition (Wechsler, 1998). ¤5BIT Total score = sum of scores of the conventional sub-tests of the Behavioural Inattention Test , including line crossing, letter cancellation, star cancellation, copying, line-bisection and representational drawing. ¤6The 'One Item Test' (Bisiach et al., 1986) and ¤7 'Comb/Razor Test' (McIntosh et al., 2000) were used for the assessment of personal neglect.

5.3.3. Video Awareness Intervention

Video awareness intervention was the only neuropsychological intervention the patient received. The same neuropsychologist (the author) conducted the neuropsychological and awareness assessments (see above), as well as administered the video intervention. At the time of the intervention, I felt that I had established a good 'researcher-participant' relationship and working alliance with the patient during previous assessments. Twenty-two days post-onset, LM's anosognosic statements and behaviour was persisting. Although she was aware of having had a stroke, she showed no acknowledgement of her upper limb paralysis and 'confabulated away' any attempts to convince her otherwise. Her anosognosia and sensorimotor deficits were formally assessed again and found to be unaltered (see Table 5.1). For example, she claimed she had moved her arm upon request and continued to claim she could perform a number of bimanual tasks relatively well (see Table 5.1). Immediately afterwards she was asked if she

was willing to watch a video of a previous assessment, to the filming of which by the bedside on a portable digital video camera (Sony Handycam, DCR) she had already consented. The film had been edited to a 90 sec clip of herself answering the awareness confrontation questions of the Berti interview (see Chapter 2 and above). In the video clip, the examiner was standing on the left side of the screen, and the patient was sitting in her wheelchair on the right side of the screen (her left side was on the right), with her torso being at a distance of approximately 1.5m from the camera. There was approximately 1m distance between patient and examiner. The patient was seen in front view with her upper body visible, including shoulders, arms, head and face. The video clip was played back to her through a laptop computer (screen size 13) placed in front of her (50cm) and about 20cm right of the centre of her visual field. A paused frame of the above-described video clip was first shown and the patient was asked to identify what she could see in the video, and right-right orientation was tested. Then she was asked whether she was willing to view a video of herself trying to perform an action and discuss it with the examiner. She was informed of the possibility of the video being upsetting and was reminded that she could withdraw from the study at any point, as well as ask questions about the procedure and purpose of the assessments. The patient chose to continue. The examiner made sure the patient's vision and attention were focused onto the screen and the 90s edited video clip was played back. Following the video the patient was given the opportunity to discuss what she observed in her own words, before her awareness was assessed again formally with the aforementioned methods, including also the 10 bi-manual, five bi-pedal and five uni-manual action awareness questions (Marcel et al., 2004). Emotional support and the opportunity to reflect upon what she had observed was then offered to LM. Follow-up assessments were arranged the following day, 36 days post-onset and 6-months post-onset as indicated in Table 5.1 above.

5.4. Post Video Observations and Results

LM immediately recognized herself in the video clip and spontaneously commented: "I have not been very realistic". Examiner (AF): "What do you mean?" LM: "I have not been realistic about my left-side not being able to move at all". AF: What do you think now?" "I cannot move at all". AF: "What made you change your mind?" LM: "The video. I did not realize I looked like this". AF: "How do you think you look?". "Well, like a person who cannot move her left side". Her awareness was again formally assessed with the same interview and it

was now consistent with both her upper and lower limb plegia (see Table 5.1), i.e. the patient immediately stated she could not move her left arm and did not even try to perform the requested actions, stating that she could not do it. The patient was evidently upset and thus she was asked how she felt about her answers. LM: “It is very sad. Mostly because you suddenly feel you have no control over anything”. It was then suggested to her that she may gain a different kind of control by having understood her condition. LM appeared to find this comment helpful, “yes, I guess having knowledge is a kind of control. I have always loved reading and valued education. I suppose this is a form of late life education” and was able to reflect on similar examples from her past that self-awareness had helped her face up to difficult situations. Conversation continued until the patient’s mood appeared stable.

The following day the examiner visited LM to see how she was feeling. LM had full awareness of her hemiplegia, remembered the previous day’s observations and her previous anosognosia. She said she felt sad but she found the conversation about “having control in a different way” very meaningful. She claimed that she remembered how she immediately ‘saw’ her paralysis on the video. Given the results of the previous experiment (Chapter 4), the examiner asked her if she perceived any movement, or sensation in the past that gave her the impression of being able to move but she denied this. Instead, she insisted that she ‘was just hoping so’. Her anosognosia did not reappear during her hospitalization (another 4 weeks), nor at a 6 month follow-up (see Table 5.1 for formal assessments and results). Staff reported that LM’s mood was low, but at the same time she was more motivated to participate in therapy, had become engaged in the plans of her re-housing and additional rehabilitation. Moreover, she now attributed her motor disabilities to her stroke.

5.5. Discussion

AHP is typically ephemeral and progressively remits due to spontaneous recovery. However, LM’s sudden and complete transition from severe anosognosia to awareness, her largely unaltered sensorimotor deficits, and her subjective perspective on the effects of video viewing render spontaneous recovery unlikely. Instead, this study documents that viewing one’s self in a video replay, and being given the opportunity to reflect on such observations, may reinstate motor awareness in anosognosic patients and speed up recovery.

5.5.1. Feedback that By-passes Motor Intentions and Motor Potentialities

In a previous study on AHP, Ramachandran (1995) has used mirrors to create false visual feedback of left hand movement in a patient with AHP. The mirror image of an assisting experimenter's hand was optically superimposed on the patient's left paralysed hand. The patient observed (from a first-person perspective), what she thought was her own left hand, moving up and down (see also Zampini, Moro and Aglioti, 2004). Although these studies are useful for the understanding of the role of vision in motor awareness, they have only assessed the observation of movements in synchrony with patients actual or intended movements. Crucially, such synchronous visual feedback had no effect on patients' impaired awareness, if anything it conformed their expectations of being able to move their left limbs as normal (see also previous Chapter for similar observations). By contrast, it was observed that observing oneself in a later time than an actual action attempt may have different effects on motor unawareness than observing oneself from an on-line, first-person perspective (as noted above, the patient's unawareness was not altered when she perceived her paralysed hand failing to execute a movement in her right visual hemifield). Thus, the demonstrated effect in the current study may relate to differences in observing an action while trying to execute it (on-line) and observing oneself at a later time (off-line, as in a video replay).

As I discussed in the previous chapter, these results are compatible with the account of Merleau-Ponty, according to which anosognosia is the result of the risk of losing one's habitual motor potentialities and more generally one's commitment to the world as the body itself 'knows' it tacitly and habitually that necessitates the denial of one's paralysis in a more abstract, reflective terms. During video observation, the patient had the opportunity to observe herself trying to perform an action and failing, while at the same time, her body itself was not really called to action. Hence, her embodied 'habits' where not challenged by the circumstances of the video observation. Instead, her more cognitive, reflective abilities were now faced with visual feedback of her paralysis, to a degree free of the prereflective knowledge of risk to her habitual motor potentialities.

As I discussed in the previous chapters, such results are also consistent with the 'motor' hypothesis of AHP. Namely, video-feedback may facilitate awareness because it by-passes the habitual dominance of forward, sensorimotor predictions in these patients. As I described above, such models maintain that motor awareness in healthy individuals relies mainly on motor predictions (Fourneret & Jeannerod, 1998); whenever the motor system makes a sensory

prediction about an intended movement, awareness that this movement has been performed is automatically constructed (Berti et al., 2007). If no large errors occur, sensory feedback matches the predicted one and hence awareness is not challenged. By contrast, large errors produce a mismatch and an error signal at the comparator, which can be used to inform and update awareness. According to one view (Berti et al., 2005), anosognosia is the failure to detect such discrepancies due to damage to the comparator mechanism, so that patients instead construct a (non-veridical) motor awareness based entirely on their motor expectations. In previous neuroimaging studies with both healthy individuals and patients with AHP, the function of such a comparator mechanism have been linked with lateral premotor cortex (particularly area BA 46; Berti et al., 2005). This area has been found to be more generally damaged in patients with AHP (e.g. Berti et al., 2005), but was only minimally affected in the present patient. Moreover, as I pointed out in Chapter 3, this area may be linked with unconscious, tacit aspects of motor knowledge (see also clinical observations above and the fact that the present patient showed implicit awareness into her deficit in the study reported in Chapter 3) and not necessarily non-veridical awareness. Thus, while the current experiment provides evidence for the cognitive aspects of this motor theory, it does not support its neuroanatomical predictions. Unfortunately, the current experiment does not have the power to make string neuroanatomical claims. Future group studies on such interventions could explore the role of this area and other brain mechanisms on implicit and explicit forms of motor awareness, as well as the precise relation between existential-phenomenological and neurocognitive theories on such phenomena.

5.5.2. Feedback from a Third-person Perspective

In addition to the above reflections regarding the role of habitual motor potentialities, and lack thereof during video replay, it should also be noted that a video replay does not only afford an off-line view of the body but also one that is 'from the outside' (a third-person perspective, as in a mirror but without the left-right inversion of mirrors) and more 'holistic' than the habitual, first-person perspective of body parts. It may thus be that the observed beneficial effects of video self-observation may relate to seeing oneself in such a third-person allocentric perspective (see Glosssary). Thus, processing action-related events from the outside may have different effects on motor unawareness than observing oneself from an on-line, first-person perspective (the present patient's unawareness was not altered when she perceived her

paralysed hand from a first-person perspective). Such opportunities for self- observation from a third-person perspective have remarkably not been previously applied in AHP, although self-observation has been shown to facilitate the treatment of other motor and somatosensory deficits. For example, mirror viewing relieves pain in amputee subjects (Altschuler et al., 1999). More specifically, in at least some patients with neuropsychological disorders of body awareness, the third-person perspective seems to have a transformative effect, leading for example to remission of autotopagnosia by mirror viewing (Tobita, Hasegawa, Nagatomo, Yamaguchi & Kurita, 1995), and increased awareness of choreiform movements following video-feedback (Shenker, Wylie, Fuchs, Manning & Heilman, 2004). Video replay has also been shown to help improve insight of psychotic patients (Davidoff et al., 1998). Although the precise relation between these effects and the present, single-case study will require further investigations, it seems that visual feedback from a third-person perspective may influence first-person awareness.

Indeed, similar differences between first- and third-person perspectives on body perception have been described even at the purely visual and 'body-part' level. For example, a neuroimaging study (Saxe, Jamal & Powell, 2006) suggests that viewing one's isolated body parts (hands and feet) from first- or, third-person perspective may be mediated by distinct brain areas; the right extrastriate body area (EBA) preferentially responds to images of body parts presented from an allocentric perspective, while a region of primary somatosensory cortex showed the reverse selectivity: the blood oxygen level-dependent response to body parts presented from an allocentric perspective was suppressed. It is thus possible that some of these areas are spared in patients with AHP and thus the general, awareness of these patients may benefit from body-part, observation from the outside, which seems at least partly independent from similar, first-person perspectives on the body. Further studies providing first- versus third-person visual and possibly also tactile feedback to patients with AHP could disentangle the distinct role of these mental and neural processes in motor unawareness.

However, it is unlikely that the current results are explained by simple, visual mechanisms of body-part recognition in the video replay. First, the video replay included a view of the whole upper part of the patients' body, including her face. The face could carry particularly rich information linking the body to the self, given its key role in personal identity (Tsakiris, 2008). Moreover, recent findings from neuroimaging studies suggest that certain posterior cortical areas are specialized for the visual processing of faces (e.g. left fusiform gyrus) vs. other body parts (e.g. EBA) (e.g. Downing, Jiang, Shuman & Kanwisher, 2001;

Morris, Pelphrey & McCarthy, 2006), allowing greater self-identification with the content of the video replay. In addition, viewing the hand and arm in relation to the patients' torso may have further facilitated the recognition of her paralysis, highlighting the link between the paralysed arm and the rest of the body. However, as this study did not systematically manipulate the spatial extent of the third-person perspective feedback (i.e. the patient was not shown feedback of her arm only), these conclusions remain tentative and require examination in further studies.

More generally, an appreciation of the current findings requires a conceptual examination that extends beyond simple, visual recognition and takes into account the complex psychological mechanisms implicated in self-awareness from first and third-person perspectives. I will undertake this below, in relation to both cognitive theories and the existential-phenomenological perspective of Merleau-Ponty.

5.5.3. Specular Images of the Bodily Self in the Cognitive Sciences

Studies in cognitive psychology and neuroscience, including investigations of pathologies of body awareness, such as out-of-body and autoscopic phenomena, have suggested that multimodal information about the body is coded in an egocentric frame of reference that seems to be critical for the conscious perception for the body as 'mine', i.e. related to the psychological self (Blanke, Ortigue, Landis & Seeck, 2002; Ehrsson, 2007; Petkova et al., 2008; see also Glossary). In fact, some authors have argued that self-identification is primarily a matter of the first-person visual perspective (Blanke & Metzinger, 2009; Petkova et al., 2008). This first-person visual perspective on the body depends ultimately on two factors: the position of the eyes within the body, and the normal posture of the different body parts. For example, we normally view the dorsum (back) rather than the palm of our hands, and we normally view the fingers further from the rest of the hand. Accordingly, most experimental studies in healthy controls have sought to examine the psychological and neural mechanisms underlying conscious perception of bodily selfhood, such as the sense of body ownership, by taking advantage of the malleability of bodily experience in the first person perspective, as for example in the Rubber Hand Illusion (RHI, Botvinick & Cohen, 1998), in which a rubber hand viewed from the first-person perspective becomes treated as part of one's body. These methods have been extended to include out-of-body experiences (Ehrsson, 2007; Lenggenhager et al., 2007) and ownership of supernumerary limbs (Ehrsson, 2009).

More recently, body ownership has been directly compared between conditions where the body is viewed from the first person versus the third person perspective (Bertamini et al., 2011; Jenkinson et al., 2013; Petkova et al., 2011). The first two studies did not find an effect of visual perspective on hand ownership during the rubber hand illusion, while Petkova and colleagues investigated the role played by visual perspective in the self-attribution of an entire artificial body. They found that the first person visual perspective is among the critical factors for triggering the illusion of full-body ownership. They suggest that the integrative process where sensory, motor and other bodily signals are combined to generate the sense of body ownership takes place predominately in egocentric rather than allocentric coordinates (but see Lenggenhager et al., 2007).

These findings on the primacy of the first-person perspective for a holistic experience of the body as ours leave open the question of what is the role of third-person perspectives on bodily self-awareness. In developmental psychology, self-observation from a third-person perspective, as in mirrors and other reflective surfaces, is considered as an important element in the structuring of one's body awareness, particularly since most of the time we only have some parts of our body in our field of view. For example, studies in developmental psychology, including the now classic Rouge Test (Amsterdam, 1972), suggest that children progressively form an increasingly complicated "body image" that involves both embodied (first-person) and disembodied (third-person, allocentric) perspectives, assisted significantly by mirror reflection. This is thought to be constructed between the age of 6-18 months (Bertenthal & Fisher, 1987; Rochat, 2003). This acquisition of a mental picture of one's own body is thought to contribute to the development of body awareness in unique ways, as it allows the child to organise its experience not only in how it experiences it from habitual, interoceptive and egocentric perspectives, but also from 'other', external perspectives (Rochat, 2003). Indeed, it has been suggested that the resulting body representation, which is visual predominately and typically refers to how the body appears from the outside, may differ from other forms of prereflective or reflective body appreciations, such as the body schema (Gallagher, 1995; Haggard & Wolpert, 2005; see also below). However, to my knowledge, the precise relation between these different perspectives on the body and motor awareness has not been further explored in the cognitive literature. The results of the present study indeed point to a unique role of third-person, visual perspectives on motor awareness but as they stand, the influence of third-person visual perspective cannot be distinguished from the 'off-line' aspects of the video intervention. Nevertheless, in the following section I will try to trace the potential implications of the present

findings to Merleau-Ponty's rich observations on the role of third-person visual perspectives on the body for self and other awareness.

5.5.4. Specular Images of the Bodily Self in Existential-Phenomenological Perspectives

As mentioned briefly in the introduction, Merleau-Ponty's central concept of the 'schema corporel' (Merleau-Ponty, 1945/1962, p. 113) has unfortunately been translated in English as 'body image', which stands in opposite to Merleau-Ponty's clear views regarding their non-representational and non-pictorial nature of this concept (1945/1962; 113-115). Indeed, Merleau-Ponty has argued in favour of a pre-reflective and tacit sense in which the body and its functional laws acts as the perceiver of experience, and not its object. This notion is best translated as body schema (Gallagher, 1995). Contrary to earlier, scientific accounts of the 'body schema' in more mechanisms terms (e.g. Head & Holmes, 1911-12) however, Merleau-Ponty stressed the holistic and 'Gestalt-like' (Tiemersma, 1989) properties of this schema and most importantly the fact that it acts as the background of one's experience and not its object. In other terms, he discussed this concept, as the existential structure of one's experience, determining a being-directed-towards the world and not as the content of one's perception of the body. In this respect, the body schema is always implicit in first-person visual experience; to see something is always to see it partially, from an egocentric perspective and in relation to the perceiving body, far or close to it, to its left or to its right. The synthesis of these features structure the perceptual predispositions and horizons of the individual, helping her to organise and structure her perceptual world in an existentially meaningful way. Yet this structuring influence of the body remain 'behind the scenes', they do not form the explicit aspects of my perception, even when this perception is of the body itself. Although Merleau-Ponty himself does not make this distinction clear in his writings, others have suggested that the latter is best described as 'body image', a term best reserved for the description of perceptions with an intentional status, i.e. either a conscious, perceptual (frequently visual) representation or a set of beliefs and attitudes about the body (see Gallagher, 1995 for an extensive review).

There is however a class of such body images that Merleau-Ponty is particularly interested in his writings and relate to the findings of the present chapter. Specifically, Merleau-Ponty focused on the role of perceived and imagined, specular images of our body, and particularly as formed based on mirror encounters, as an important moment in the development

of self-awareness (1960/1964, p. 119). Specifically, in his paper ‘The Child’s Relations with Others’ (1960/1964), based on one of his Sorbonne lectures, he puts forward his view on the progressive development of self-awareness out of what he describes as a first, infantile state of non-complete, psychological differentiation between self and other. Although Merleau-Ponty’s views on intersubjectivity and its development, and their rich intellectual context, far exceed the scope of this thesis, I briefly outline his views here with special focus on the role he reserves for ‘specular images’ of the self.

Specifically, he argues that the specular image of the baby, and its corresponding imagination of the self as seen from the outside, lies at the basis of the objectification of one's own body. The realization that one can be seen from the outside, a realization that according to Merleau-Ponty was previously unsuspected from the point of view of the baby. Importantly, it is this specular body-objectification that allows the establishment of a sense of self and other as two separate beings, or what Merleau-Ponty calls a "segregation" between myself and other (1960/1964; p. 119). Previously there was a lack of distinction between the infant and other, they operated in an anonymous collectivity, an undifferentiated whole, or in a syncretism " the indistinction between me and the other, a confusion at the core of a situation that is common to us both." (Merleau-Ponty, 1960/1964; p. 120). Thus according to Merleau-Ponty the historical development of the self, as a being not only directed towards the world but able to reflect upon its existence and individuality, is constitutionally depended about the experience of perceiving the self from a third-person visual perspective.

Most importantly, for Merleau-Ponty this autoscopic objectification is not a mere intellectual acquisition as it may be for some of the cognitive studies and theories reviewed above. Instead, the recognition of the mirror image of the body as the specular image of the self has emotional significance in at least two related ways. First, it marks a separation between the embodied, prereflective, felt self and the observing, perceiving and reflective (possibly judging) self. Second, as I argued above, it marks a separation between the embodied, prereflective, felt self that included others in a confused way and the observing and possibly judging other. The child according to Merleau-Ponty realizes for the first time that he can be perceived by others in ways that previously could not imagine and cannot control. The possibility of such social perceptions allow both the formation of an independent self, as well as the understanding that this self is actually granted by the other and hence the self is ultimately always dependent on others.

More generally, the paradox and duality of intersubjectivity at the heart of human existence lies at the idea that the affirmation of our own existence relies on our affirmation by the other, so that their presence and image is simultaneously our horizon of being in the world and the imprisonment of our embodied existence. According to Sartre for instance, other people have a particular affect upon us that inanimate objects do not. Other people, their actions, judgements and their own freedom, have a unique handle on our freedom. In the dimension of existence that Sartre calls *being-for-others*, we come to realise that other people objectify us and this realisation, intrinsic in the recognition of ourselves as separate from others, affects us emotionally. In a part of Being and Nothingness called 'The Look' Sartre (1989/2003) explains that when other people gaze at us it is as though this look objectifies us from within, positions us in the world in a separate way, so that we exist in the world for others, as they exist for us. This introduces unshakable feelings of shame, self-alienation and other similar, social emotions. Sartre stressed the related power and dominance desires at the heart of human relating and particularly, sadistic dominance, masochistic submission and indifferent withdrawal.

Contrary to Sartre, Merleau-Ponty stresses both the positive and negative aspects of our complementarity with others, including for example our ability to feel empathy for others and also trusting they love us beyond the need to be constantly objectified by them as 'loved objects'. In consistent, contemporary phenomenological writings, both physical and more general instances of social mirroring have been described as serving the crucial function of unifying one's interoceptive and sensorimotor experience with an external image of oneself *that is simultaneously understood as being also accessible to others* (see Rochat & Zahavi, 2011 for review), allowing for both positive (empathy) and negative (social objectification) aspects of our emotional relation with others.

Most importantly for the present study, the developmental perspective that Merleau-Ponty adopts on self-objectification and the formation of explicit, reflective self-awareness, allows us to see the role of third-person visual experiences in the constitution of self-awareness and in a more stable separation of the self and the other. These reflections suggest that the improvement in awareness observed in the present study may relate to the patient's observation of the paralysed body, which allowed her to gain awareness into her paralysis despite its denial from a first-person perspective. Interestingly, given that most (but not all, Ramachandran, 1995; Moro et al., 2011) patients with AHP seem able to recognize similar motor deficits in other people, it is possible that these same patients may also be able to recognize their own

impairments in a mirror (on-line, third-person perspective on the body). More generally, testing the motor awareness of patients with AHP in front of a mirror in future studies would also be useful to disentangle the 'off-line' (as in video-replays) from the third-person perspective elements of the current findings, which is not possible with video replays.

Indeed, in order to understand the fact that the present intervention led to a permanent rather than a temporary reinstatement of awareness in the patient one needs to consider the subtle diffences between perspective taking (the third-person online feedback on the self one can receive from mirror self-observation) and more general allocentric and off-line reflective thinking afforded by video-replays and proposed by Merleau-Ponty (see also Glossary). Specifically, there is a recognised distinction in spatial cognition, as studied in psychology, in philosophy, as well as in social cognitive neuroscience between egocentric and allocentric processing and first-person and third-person perspective-taking (for review see Frith & De Vignemont, 2005). The third-person perspective may involve a translocation of the egocentric viewpoint (Vogeley et al., 2004). For example, when I think of what a friend may think about my new dress, I can mentally take their perspective and as it were 'look back at me'. Although this would be a third-person perspective on the self, it can remain egocentric if the subjective sense of myself is one of looking back at me. Thus, the cognition required can still be considered egocentric, i.e. centred on my own body, even if translocated to another person's point of view. By contrast, when I am asked to reflect on what my friend John thinks of my friend's Mary's dress, I consider the perspective of John in relation to Mary, irrespective of my own perspective. In this sense, the latter is an allocentric inference. In allocentric representations of others or the self, the target is represented irrespective of the agent's standpoint. Thus the self can be considered as a person among others. It is not me looking back at myself but rather my identity exists in the mind of other people irrespective of my own perspective on it. A similar distinction can be drawn in relation to time. I can think of my self in childhood from the perspective of a given time in my adult life, or I can think of myself from anyone's perspective in time. In my understanding of Merleau-Ponty writings on the social self it is the latter meaning of the self beyond the 'here-and-now' of experience that he sees as central to self-reflection. The permanent effects of the video-observation can indeed be linked to such ideas. When observing oneself in a video reply, the third-person and off-line perspective afforded by the video is not one that a person experiences egocentrically, from the point of view of the video-observing body. Rather the self in the video is a more permanent record of the self that can be seen from many perspectives and in different times. In that sense

the video may have long-term effects on awareness because it facilitates reflection in third-person, allocentric terms. Of course, these are assumptions that have not been tested in this thesis. Future research should examine patients egocentric and allocentric cognitive and emotional abilities in dedicated experimental tasks.

5.5.5. The Role of Emotion in Body Awareness and Implications for Existential Counselling Psychology

Furthermore, it should be noted that awareness improvement in the current study was not accompanied by any changes in performance on neuropsychological tests of cognitive function, or sensorimotor abilities, but rather with a large increase in depressive feelings as captured by a self-report measure, and were evident during testing and were also noted by hospital staff. As described in the introduction, the possible role of emotion in AHP has long been debated in the field. Indeed, there is long history of related clinical observations and theoretical debates (Weinstein & Kahn, 1955; Bisiach & Geminiani, 1991). Patients are typically described as manifesting some degree of blunted affect or 'indifference' for their disabilities. This indifference (anosodiaphoria, Babinski, 1914) can co-exist with AHP or it can occur without a concomitant explicit denial of deficits. On the contrary, depressive symptoms and 'catastrophic reactions' (sudden influx of strong, negative feelings and related behaviours; Goldstein, 1939) are encountered rarely following right-hemisphere damage. Nevertheless, some clinicians have long argued that there is a link between awareness and depression in the sense that as unawareness decreases over time, depressive symptoms begin to emerge in patients who were previously emotionally unresponsive towards their paralysis (e.g. Kaplan-Solms & Solms, 2000). Some patients even show a disproportionate exasperation with irrelevant, minor disappointments, despite their apparent indifference for their paralysis (Weinstein & Kahn, 1950; Kaplan-Solms & Solms, 2000; Fotopoulou & Conway, 2004). These observations are consistent with the results of the present study, which further suggest that the role of negative emotions needs to be taken into account in future protocols and perhaps more formal and longer counselling or, psychotherapeutic sessions need to be provided to patients. More generally, consistent with the most general principles of counselling psychology, this case study suggests that taking patients emotions into account may be an important component of any successful intervention for AHP (see also Prigatano, 2005), as also shown in other

neurological syndromes that entail memory unawareness, such as confabulation following acute, frontal lobe damage (see Fotopoulou, 2008).

While the primary focus of the present study was not the role of emotion in body awareness, long debates have surrounded this question. As described in the introduction, some authors have argued that the above clinical observations on the emotional tendencies of patients with AHP are caused by purely psychogenic 'defence' mechanisms. According to the theory of Weinstein and colleagues (e.g. Weinstein & Kahn, 1955), avoidance, denial and other unconscious coping mechanisms prevent patients from explicitly acknowledging their paralysis and the related negative emotions. Other authors have however proposed that this lack of emotional reactivity is the direct consequence of damage to the (frontal) right hemisphere, a brain area specialised for the processing of negative, withdrawal-related emotions (see Gainotti, 2012 for review). However, neither of these two approaches has been fully supported by empirical evidence. The psychodynamic account cannot explain the relative neuroanatomical and behavioural specificity of AHP (Bisiach & Geminiani, 1991; Heilman & Harciarek, 2010; see also Turnbull et al., 2014). The 'valence' hypothesis has similarly not been supported in the literature; although patients with AHP do typically score lower than control patients in self-report measures of depression and anxiety (e.g. see Chapter 3), more sensitive investigations have shown that they do not differ from controls groups in their ability to experience such emotions (Turnbull, Evans & Owen, 2005; Vocat et al., 2010). They also show appropriate, negative emotional reactions to their deficits when the latter are evoked implicitly (Nadrone, Ward, Fotopoulou & Turnbull, 2007; see also Chapter 3). Thus, it appears that the relation between AHP and emotion is more complex than suggested by either the psychodynamic or the valence hypothesis.

From the point of view of the perspective put forward by Merleau-Ponty, one could hypothesise that negative emotions are absent in the patient with anosognosia to the degree that he is unwilling to withdraw from his habitual, tacit commitment to the world, even at the expense of the 'erasure of reality' (1945/1962, p. 99). Yet at the same time, as I discussed in Chapter 3, the denial of one's paralysis is constituted precisely upon the prereflective awareness of a threat to one's habitual possibilities of embodied being. Thus, the reinstatement of a self-reflective stance following the video-replay, due to either the 'off-line', or the third-person aspects of the video-replay, may also allow the subject to experience the hitherto unsuspected emotions that are associated with the threat to one's bodily integrity and action possibilities in the world. More generally, this ability to perceive the body 'objectively' in both

space and time, i.e. from the viewpoint of any other person, as well as independently of one's current intentions, may also be developmentally linked with one's ability to face some of the challenges of our existence (such as the separation of our self-reflective abilities from our prereflective self, and the similar separation between self and other), and the related negative emotions. This discussion leads to long and complex discussions on the nature of intersubjectivity that lie beyond the scope of the present thesis. Moreover, whether the ability to experience such negative emotions is primary or secondary to AHP (i.e. it is not clear whether this inability is the cause or the consequence of unawareness) is currently an open, empirical question (see also Mograbi et al., 2012; Besharati et al., 2014). However, the present study provides some preliminary indications that simply providing off-line and third-person visual feedback to such patients may facilitate their awareness and bring about negative emotions that can then be shared with others and reflected upon in appropriate psychotherapeutic contexts (unlike the current limited, research context).

This observation is of obvious relevance to existential counselling psychology and raises the question of whether the video-replay is necessary, or even ethically appropriate in such contexts. It can be instead regarded as a very crude and confrontational way to expose a patient to her paralysis. Moreover, at first sight it is unclear why the therapeutic relationship itself cannot operate as a facilitating mirror for the client, exploring the experiences of the client in a non-judgemental or objectifying ways, and at the same time endeavouring to opening up the horizons perceived by the individual as described in Chapters 3 and 4. Indeed, Kaplan-Solms and Solms (2000), reported that when themes of loss are explored during psychotherapeutic sessions, transient awareness and depressive episodes can be experienced by patients who are otherwise stably anosognosic. Marcel and colleagues (2004) have further found that when questions are expressed in an emotional, conspiratorial manner, or from the perspective of the examiner, patients with AHP may show increased awareness regarding their paralysis. These observations raise the possibility that verbal, third-person perspective feedback may have similar effects as visual, 'mirror-like' feedback. Although this of course remains a possibility, it should also be noted that despite the occasional insights from a third-person perspective (e.g. in the aforementioned psychotherapeutic and research descriptions) and the frequent social reinforcement of the third-person perspective on the body by healthcare staff and carers, anosognosic patients are known to remain more generally anosognosic and to express a marked dissociation between what they know others to believe and what they experience (e.g. "I know my husband thinks I am paralysed, but I know I am not").

Moreover, the use of video-replays may have a unique role in the treatment of anosognosia in relation to two particular aspects of this syndrome: (1) as mentioned in the introduction, the presence of AHP at the acute stage of recovery following stroke, where there is little time for extensive psychotherapy provision, acts to worse patients prognosis and functional recovery, even if the AHP eventually recovers and (2) as discussed in this chapter, there is the possibility that video-replays facilitate the 'objectification' of the body, over and above any verbal or psychotherapeutic interventions, because the brain areas specialised for such perceptions of the body may be spared by the brain lesion that has nevertheless affected other aspects of bodily self-awareness. These possibilities need to be assessed in future studies, including also investigations of the subjective experience of clients when faced with video-replays of themselves.

5.5.6. Methodological Limitations and Future Directions

It should be noted that the present study has a number of limitations. Firstly, this study was a single case study, with the well-recognised and extensively debated in neuropsychology epistemological advantages and disadvantages (see Fotopoulou, 2014 for discussion). From the point of view of 'quantitative research methods' and the emphasis of 'evidence-based practice' of policy makers, the present findings will need to be replicated in a sufficiently powered, randomised controlled study (RCT), using a standardised protocol. However, preliminary case studies of this kind are important since there are no previous RCTs of any intervention in this population, and as I have outlined in the introduction (see also discussion), individualized clinical approaches may be particularly pertinent in the case of anosognosia. Moreover, the focus on 'practice-based' research in individual cases is a crucial epistemological value in Counselling Psychology (see also Introduction and Discussion). There is also very little prior knowledge available in stroke research about the video, or other similar interventions to be used. Thus, even from the perspective of quantitative research methods, it is vital to evaluate the feasibility of applying such bedside intervention `in the real world', as well as testing the acceptability of and adherence with the intervention and estimating important design parameters before planning a large-scale, randomised controlled trial.

Indeed, as discussed above, the present study highlighted that while this simple, psychophysical intervention seems potent, it may not be sufficient, not even appropriate for

awareness restoration in all patients. At the very least, this intervention needs to be embedded in a wider and perhaps individualised intervention protocol (see also Prigatano, 2005), involving the provision of psychotherapeutic support for the related emotions and self-perceptions. In all cases, the current results suggest that in order to establish a good clinical relationship with the patient, it is not advisable to begin the intervention too soon after first meeting the patient.

There are also a number of other intervention parameters and facets that this study did not assess and should be explored in future case studies. Given their lack of insight some patients may be resistant to recruitment. Moreover, patients have varying stroke severity, neuropsychological, neurological and medical profiles. In addition, in clinical practice, the precise protocol for each individualised rehabilitation program is conditioned by personal and institutional variables. For example, it is important to consider that not all patients may be appropriate for video intervention and that it is important to individuate the times when it is possible to suggest it. Moreover, severe spatial neglect that cannot be by-passed by prompting may prevent some patients from seeing left side of the screen when watching the video replay. Severe attention and memory problems may also reduce the effectiveness of the video observation. Unawareness itself is multifaceted and can differ in specificity and extent. For example, some patients may be aware of their upper but not their lower limb paralysis (Marcel et al., 2004). Thus, the potential `transfer' across awareness domains of the restorative effect of video therapy needs to be assessed and the therapy needs to be modified accordingly. Finally, no study has assessed time- or treatment-related brain lesion changes in patients with motor unawareness following stroke. Specification of the relationship between cerebral re-organisation and treatment-related changes could potentially highlight important mediators and moderators of the treatment effects.

Accordingly, certain practical aspects of the video intervention itself will need to be tested and calibrated including any associated psychoeducation and psychotherapeutic components, the duration of treatment sessions, the duration and quantity of edited video clips in each session, the optimal time lapse between sessions, the necessity of breaks/ reminders, the extent/type of motor errors highlighted, the body parts captured in clips, the use of ratings by therapist and patient, procedures capable of by-passing the effects of neglect, procedures

for ensuring sufficient attention and concentration during video-viewing, the optimal proportion of `successful' versus `unsuccessful' tasks to be used for maintaining engagement and the optimal filming and projection angles/distance, the optimal sound levels.

5.5.7. Summary and Conclusion

This single-case study provides preliminary evidence that when right hemisphere damage impairs the ability to update first-person body awareness, judgements relying on off-line, self-observation from a third-person perspective may be spared and may provide facilitating visual feedback towards reinstating motor awareness. Further studies should explore the usefulness and generalization of self-observation 'from the outside' in unaware patients, its optimal timing and relation to emotional factors, neglect and spontaneous recovery. In all cases, it should be noted that it was not the intention of the present study to suggest a generally applicable and stand-alone intervention for the treatment of AHP. Rather the aim is to determine the critical mediators of any dynamic change of awareness in these patients. By identifying such dynamic mechanisms, the thesis aims to generate new knowledge regarding the nature of motor and body awareness and its relation to wider existential considerations in the formation of our self-awareness.

6. Discussion

6.1. Summary of Thesis

In this dissertation I aimed to explore from an interdisciplinary vantage point the way in which the body is experienced in people with AHP following a stroke. Ultimately, I envisioned that the discussion of the findings could contribute to existential theory and existential counselling psychology. More specifically, taking as a starting point the existential-phenomenological perspective on embodiment put forward by Merleau-Ponty, I aimed to provide an alternative to the one-to-one aetiological relations between neurological deficits and unawareness proposed by current neuroscientific models of AHP. The epistemological principles I followed in this thesis were informed by the ideas put forward by Merleau-Ponty regarding the value of studying psychological phenomena following brain damage, particularly as formalised by current 'neurophenomenological' approaches (see Chapter 2 for review). Specifically, given the paradoxical nature of unawareness of paralysis following right-hemisphere damage, I made the paradoxical choice of aiming to explore existential-phenomenological ideas regarding the experience of embodiment and selfhood by using quantative research methods from experimental psychology and neuropsychology.

I recruited 14 patients with right hemisphere damage following a stroke and conducted three separate experiments, even though only eight out of the 14 patients could be tested in the second experiment and the last experiment was a single case study. These three studies addressed the following three hypotheses regarding the nature of AHP, respectively: (1) the possibility that at least some patients with AHP have a prereflective awareness of their deficits, despite their conscious, explicit unawareness (2) the possibility that at least some patients with AHP show explicit unawareness because of their prereflective, bodily awareness and (3) the possibility that 'artificially' by-passing such tacit awareness with the use of video-replays may contribute to the restoration of conscious awareness of paralysis in at least some of these patients. Results confirmed all three hypotheses. Specifically, the first experiment found that six out of seven patients with explicit unawareness of their paralysis showed behavioural indications of 'pre-reflective' awareness. The second experiment showed that motor intentions and expectations rather than sensory deficits seemed to drive patients' unawareness of their

paralysis, in the sense that they are aware of similar errors when these are not preceded by motor expectations. Lastly, a simple video intervention, during which a patient can see herself failing to perform an action at the time that she did not have the intention to do so (i.e. off-line), helped the patient recover her explicit awareness of her paralysis, particularly when this was accompanied by psychotherapeutic reflections and shared exploration of the painful but empowering insight generated by the video replay.

These findings were discussed in relation to their respective neurocognitive and philosophical background literatures as well as in relation to their implications for existential counselling psychology, in each of the preceding chapters. In this chapter, I reflect critically on the personal, epistemological and ethical issues that the research results raise and finally, in the context of these reflexions, I address the wider implications of the thesis's results for existential counselling psychology.

6.2. Reflexivity: Personal, Epistemological and Ethical Hindsight

6.2.1. Personal and Epistemological Reflexivity

In Chapter 2, I presented my own position in relation to this research topic and particularly the tension between the mental and the somatic and its relevance to Counselling Psychology. I reviewed my training and professional background and outlined my biases, fears and goals for this research. In this section, having the first-person experience of meeting the patients, conducting the experiments, analysing and writing-up the data, I reflect on the implications of my positioning for the results and most importantly, their potential meaning and value to the field.

The first consideration is the existence and specificity of the hypotheses I set out to investigate and their effects on the results. As I outlined in Chapter 2, I was always intrigued by clinical indications and previous writings of tacit awareness in anosognosic patients and the paradoxes they entail, and hence I was curious to examine whether Merleau-Ponty's relevant intuition about the existence of such forms of implicit awareness and its effects could be empirically confirmed. Thus, it should be stressed that the prominence of this topic in the thesis is in no way intrinsic to the phenomenon under consideration. As far as this thesis goes, tacit awareness is no more central to anosognosic phenomena than any other of its facets, e.g. the many other concomitant symptoms that accompany anosognosic behaviours or statements. In

other terms, the prominence of these findings and conclusions regarding anosognosia in relation to other potential findings portrays nothing else than researcher bias. These topics are not what the patients themselves chose to discuss or reveal to me. It is what I attempted to focus on and probe. In this sense, one could argue that I have not prioritised the patients' subjectivity, nor entered a non-hierarchical relationship with my 'co-participants', as the values of Counselling Psychology dictate (Cooper, 2009). Indeed, throughout the thesis I have chosen to refer to the participants of the research as 'participants' or even 'patients'. This was a conscious choice, I believe consistent with the third-person, quantitative methodologies I have chosen to use, as well as with the embodied and medical reality of the participants (see also below).

As I have outlined in Chapter 2, these choices reflect my belief that when trying to tackle complex, unconscious psychological phenomena about embodiment from an interdisciplinary perspective, one should try not to 'cancel out' the third-person 'reality' 'of the body' that these patients find themselves in, i.e. the reality of their paralysis, of their brain damage and the reality of their stroke. Of course, paradoxically, this is the very reality that they themselves deny. It is axiomatic to this condition to subjectively deny one's paralysis. Yet, as I tried to explain in Chapter 2, this fundamental paradox requires a very careful balance between the mental and the somatic and thus between first and third person methods. As I have written in the context of amnesia and confabulation (Fotopoulou, 2008), I do not believe that colluding with, or contradicting patients subjective beliefs is the answer to exploring this paradox. In the case of anosognosia, minimising the reality of their hospital 'patient-status' and their change in their habitual embodiment (i.e. their paralysis) would in a way also mean colluding with patients' 'reflective consciousness' at the expense of their embodiment. The answer I thus feel is a more messy, to be discovered in action, in therapy, and even in 'action-based', practical, probing research. Indeed, I hope this study demonstrates that a potential part of the answer perhaps lies in 'probing' both their reflective abilities and their embodiment directly, experimentally (see Chapters 3-6) and from different perspectives (see Chapter 6). I think my position stems from a willingness to tolerate the paradox itself and knowing that all choices, even research choices, entail a loss or at least a compromise. In the case of this thesis, the major loss lies in the fact that I have not been able to explore patients own subjectivity for its own sake, nor established a close, equal, therapeutic relation from which intersubjective meaning could be drawn. Everything this thesis therefore claims is from a third-person, somewhat disengaged position. Any inference of subjective or intersubjective meaning, and

hence value, is therefore one of theoretical, reflective nature on my part, yet in 'respect' of my own perspective on the patients 'embodiment' and particularly their stroke and the consequences it may have on one's subjective sense of the body. I realise that this is an approach that may be met with various criticism within Counselling Psychology, some of them valid, but at the same time I think it is fair to argue that such criticisms are in part the result of a certain neglect of the physical body within the field of Counselling Psychology and psychotherapy more generally (see Wahl, 2003 for review). Although there have been exceptions in the history of the field (e.g. bioenergetic approaches in psychotherapy), most counsellors are not trained in body-focused therapy or research and similarly the epistemology of research in the field is mainly focused on studying 'mental components' of client's experience, using methods that prioritise reflection, verbal reports and therapeutic dialogue, or interview research techniques. As Conger has reflected "the body has been invisible, for years unaddressed and ignored, left in the waiting room of the therapist's office (Conger, 1994, pp. 211).

Similarly, one has to wonder what 'empirical confirmation', in the form of the quantitative research undertaken in this thesis, adds to the previous clinical observations and writings on the topic. Is it a mere need on my part to have my interests, readings and first-hand observations, 'confirmed' by third-person methods and perhaps some kind of scientific authority? Although I do admit that I have enjoyed and benefited from the 'familiarity' of experimental methods for exploring such difficult topics in such a challenging setting (the acute stroke ward) and with such challenging conditions (e.g. the medical and cognitive difficulties encountered by patients), I believe that my desire to explore these questions with experimental methods is actually more than just such an emotional need for confirmation by some 'authority', and the 'empirical confirmation' is of added value to the study of anosognosia, as well as to the field of counselling psychology. More specifically, I would like to believe that the results of the study can serve as a first step towards an interdisciplinary consideration of anosognosia for hemiplegia, with direct relevance to Counselling Psychology of both practical and theoretical nature.

Specifically, as I have outlined in the introduction, there is a paucity of psychotherapeutically-relevant research on the disorder and an equally rare acceptance of anosognosia as a 'real' psychological phenomenon. Hence, if research is ever to be relevant for policy changes, and particularly policy changes that may affect Counselling Psychology, then such research needs to have some impact in the clinical fields that are currently exposed to

anosognosic patients at acute stroke wards. These are currently mostly neurologists, neuroscientists, psychiatrists and to a lesser degree clinical psychologists (see Introduction), and of course physiotherapists, occupational therapists, speech therapists and nurses. Quantitative methods and the kind of results they tend to generate are more likely to have impact in these fields than qualitative methods. I have frequently heard clinicians in stroke wards describe these patients as 'difficult' and there are frequently a lot of challenges involved in their care, as they come across as suspicious, more aware than they are willing to admit, indifferent one minute and upset and aggressive the next. As Chapters 3 and 4 show, this occasional tacit knowledge and the sudden emotions that may accompany it (see Chapter 6), does not mean that these patients are aware of their deficits, nor that they are indifferent about them. As I have tried to show in this thesis (Chapters 3 and 4), it may mean that our reflective and our embodied awareness are not one and the same, and these patients find themselves in a paradoxical dissociation between them. I think that if these patients are going to be ever offered proper psychological support in acute wards, both quantitative and qualitative research is needed on the complex relation between our subjective reflection on our body, our habitual awareness of our embodiment and all the emotions that their relation entails.

Moreover, it should be mentioned that despite the general appreciation of quantitative methods as not respecting the 'uniqueness' of each individual (an important value of Counselling Psychology, Cooper, 2009), there is a long tradition of 'case studies' in neuropsychology and related, specialised methodological innovations. Of course, the studies used in this thesis did not focus on how one's stroke and its resulting disability was perceived by every individual patient in the recruited sample (for the reasons outlined above), however as Chapters 3 and 5 reveal, some of the results generated in this study, even if they are aimed at 'universal principles' such as the 'existence of tacit awareness despite explicit unawareness' they nevertheless are able to generate some results that apply to some individuals and not others. Thus, for instance, in Chapter 3, I was able to show that only 6 out of 7 of the patients showed tacit awareness into their deficit and explore some of the particular characteristics of the single patient that differed from the rest. Chapter 5 is a single case study, which by definition means that the research is focused on one particular individual. Moreover, given the close relation between neurological and neuropsychological quantitative research, these methods allowed me to formulate and then implement the video-based intervention. As I described this intervention has a 'hands-on', visuomotor element that originated from quantitative explorations of the disorder (as presented in the preceding chapters). Nevertheless,

'in practice' this intervention was implemented in a single case study and focused on the immediate reactions, emotions and reflections of the particular patient. In this regard, it is not possible to separate the video-component from the reflections and conversations that took place between the patient and myself, during which the 'meaning' of the video was shared, negotiated and intersubjectively created. I believe that in this sense, quantitative research methods can be applied 'in practice' and hence generate insights that are relevant to both the individual patient but also more broadly to counselling psychology.

Finally, although scientific, and particularly neuroscientific authorities enjoy particular prominence in recent years, it should not be forgotten that 'empirical, third-person methods' are carried out with established methodologies that despite their limitations in scope (i.e. quantitative methods are reductionist in many regards) can be rather evaluated by peers with some degree of transparency against specific, criteria and irrespective of the 'status' of the researchers in the field. To a degree this also applies to systematic, qualitative studies. Yet, it does not apply to simple, anecdotal clinical observations, nor philosophical writings. These are the kind of 'proof' the literature contained for tacit awareness in anosognosia before I set out to conduct this doctorate. When these are expressed by recognised authorities in philosophy or in psychotherapy are equally authoritative. I thus do not feel that I have been predominately driven by the need to confirm these intuitions by mainstream, authoritative, methods. Rather, I firmly believe that given the deeply intertwined relationship between mind and body, as well as between subjectivity and objectivity, the results of first, second and third-person methods should be able to converge at some level, despite their differences and tensions. It may well be that some of the findings of this thesis may not be found if another examiner assesses the patients behaviour, or maybe some of the findings generated by the current results may not be experienced at all by some patients, or may be less emphasised and prioritised by some other patients. Nevertheless, I believe there is some generalizable psychological and psychotherapeutic value to the current observations, constrained as they may be by my own biases, my presence, the particular participants, the particular experiments and the particular context and culture in which they were generated. At the very least they can serve as the starting point for future observation with other methods, and particularly first- and second-person methods (Finlay & Evans, 2009).

6.2.2. Ethical Reflexivity

As part of the 'general Methods' section of the thesis (Chapter 2), and in each empirical Chapter, I have discussed the various ethical issues and risks raised by the research and the steps taken in advance to mitigate them. Specifically, I will discuss the factors that lead to potent and distinctive sources of ethical dilemmas in psychotherapy in neurorehabilitation settings and particularly in people with unawareness into their neurological condition. Of course, practice in neurological settings is governed by the values and standards of practice of the relevant professionals, as well as by the national health system involved. These standards and values are typically transmitted through formal and regulated education and a certain degree of 'automaticity' is expected in their application. Nevertheless, and despite the usual requirement of 'bracketing-out' assumptions while in a psychotherapeutic session, certain situations may arise during neuropsychological psychotherapy that challenge personal and professional assumptions and lead to ethical dilemmas. Dilemmas have been defined as complex problem situations that involve tension and paradox, where all potential solutions appear to be unfavourable, where potential solutions conflict, and where it is difficult to act (Sekereka & Bagozzi, 2007; McGrath, 2007). Existentially- and phenomenological-trained psychotherapists would know that dilemmas are to a degree unavoidable in any setting. In the case of brain damage however, it has been argued that the unique combination of psychosocial and medical factors raises specific ethical issues (Malec 1993; Tarvydas & Shaw, 1996).

In this discussion, I will focus particularly on dilemmas that arise in relation to two factors. First, I reflect on the fact that research, as well as counselling and psychotherapy in acute anosognosia clients and other stroke survivors at acute wards can be offered only in the context of a multidisciplinary team of rehabilitation professionals. Second, I reflect to the wider social context in which AHP and other neurological deficits occur and its implications for research and practice. In both cases, I refer first to ethical issues I encountered and considered during or after conducting the research and second, I refer to the wider ethical implications raised by this research, particularly as regards the practice of Counselling Psychology with this population and brain damage patients more generally.

The Role of the Psychotherapist in a Multidisciplinary Stroke Team: Specialised Knowledge, Tolerance of Unknowns and Recognition of Separate Professional Perspectives and Priorities

It well-recognised that specialized treatment and rehabilitation are crucial for improving functional outcome and quality of life in brain damage survivors (e.g. British Psychological Society Briefing Paper, 2002; Stroke Unit Trialists' Collaboration, 2003). Thus, patients with right hemisphere damage and anosognosia, as well as other stroke survivors find themselves in busy wards, where key features of care are a dedicated multidisciplinary team and specialised rehabilitation, prevention and adequate treatment of complications. The present study was indeed conducted in such a ward, in which an unusually large range of professionals and their professional values and assumptions may need to be balanced in various situations (Kjellstrom et al., 2007). Moreover, as exemplified by the group studied in this thesis, clinicians, clients and families may have only partial information in their disposal given the genuinely interdisciplinary subject matter of brain-mind relations and the implications they may have on domains of being such as one's ability to appreciate and come to terms with one's disability.

As mentioned in the Introduction, assessment by a neuropsychologist and psychological therapy and counselling should be available when needed and is recommended in most existing surveys and guidelines (e.g. National Sentinel Audit of Stroke, 2008). However, these recommendations are not always implemented. Indeed, none of the patients that I encountered in this thesis had seen a psychologist, or a psychotherapist as part of their routine post-stroke care. In some cases, the stroke team would refer a patient to a 'liaison' clinical psychologist or psychiatrist but generally there seemed to be an unspoken avoidance for such referrals. Some staff (mainly occupational therapists, physiotherapists and junior doctors) admitted to me that the team avoided such referrals because they felt that such colleagues were not really engaged in the rehabilitation process, offering either psychometric assessments of cognitive function or psychoactive medication respectively, rather than more specialised opinions on the mood, cognition and motivation of patients, in a way that may be useful to their care. It is of course hard to generalise from the experience of one ward and such informal comments. Nevertheless, these experience tallies with my previous experience in amnesia research, where I found that other professionals preferred to engage with 'research psychologists' who were trying to understand these patients from interdisciplinary perspectives that include both 'brain' and 'mind' considerations (see for instance, Fotopoulou, 2008). Interestingly, some of these reflections concern also the well-being and psychology of staff in the stroke ward. I have been amazed for example to see that stroke wards have no psychological support provision for their staff, despite the fact that they deal daily with an intense, stressful environment, where

disability and death are the rule rather than the exception (see also next section). One wonders how burnout and related consequences are acknowledged and dealt with in such environments.

Some of the unique challenges encountered in this thesis, that also apply more generally in neurorehabilitation settings include the fact that brain damage involves profound novelty and great complexity and requires specialised knowledge in psychotherapists, as well as in other professionals. Indeed, if the role of a psychotherapist or a counselling psychologist is likely to be most effective within a specialised, multidisciplinary team, then they need to have specific clinical skills and experience in neurorehabilitation, as well as thorough knowledge and skills in neuropsychological and psychological assessment. These skills are not typically part of a counselling psychologists formal training and thus a counselling psychologists may not be familiar with psychological presentations of neurological conditions such as for example the neglect and anosognosia examined here, or other symptoms such as aphasia or amnesia, nor the intricacies of therapeutic leverage in the treatment of conditions with unclear psychogenic versus neurogenic origins. I do not mean to imply that they need to be as knowledgeable as clinical neuropsychologists, which is a specific specialisation in the UK but they need to have some familiarity with neuropsychology in order to be able to interact efficiently with the clinical team and clients.

For example, as in the case of anosognosia examined here, frequently neurological conditions require psychological therapy and more general neurorehabilitation with a degree of uncertainty about the precise brain and mind mechanisms that lead to a dysfunctional behaviour. For instance, in some cases a patient may show stroke-like symptoms, including motor, cognitive and emotional difficulties, but there is no clear neuroradiological evidence for a stroke. This uncertainty is to a degree unavoidable and I addressed the consequences of not tolerating such uncertainty in relation to anosognosia in this thesis. In fact, following from the insights of Merleau-Ponty, I used third-person methods in neuropsychology to show that the categories of ‘psychogenic’ and ‘neurogenic’ are unsuitable to characterize symptoms such as anosognosia that at the border between the mental and the somatic. This insight is a valuable perspective that the counselling psychologist may bring to multidisciplinary teams, for example stressing the mean that symptoms may have for the patient irrespective of their cause. Despite this however, tolerating uncertainly is not synonymous to ignorance or avoidance of the subject matter of other fields. Specialized training and experience can help psychologists to proceed in risk-assessment of various treatment options and then make informed choices in an attempt to

optimize rehabilitation, avoid harm and promote care, despite the unknown territories and the interdisciplinary dilemmas involved with impairments of the brain and their consequences on the mind.

For example, brain damage may affect some of the identifying markers of what professionals recognize as 'a person' and thus increase the likelihood of 'dehumanisation' and 'objectification' by some professionals. For example, people may become behaviourally unpredictable and disinhibited, cognitively impaired, socially inappropriate, needing immediate satisfaction of needs and show other characteristics that are counterintuitive and may appear as childlike, or even animal-like to others (Merleau-Ponty, 1962). Such changes may lead to a number of professional dilemmas. In neurological tradition, for instance, doctors, nurses and therapists may refer to hospitalised, neurological patients in the third-person in their presence (e.g. during a ward round a doctor may say "the patient has lost sensation of his arm, does not remember his recent past but motor functions are intact". This kind of third-person presentation may put the patient and the attending psychologist or psychotherapist in a very difficult position. Indeed, such occasions were frequent during this research, as for instance when one nurse interrupted my session to inform me that "I should not listen to the patient because he cannot really move". I thanked her for her concern and information but I explained, in front of the patient and in the second-person when referring to the patient, that as far as my research was concerned I was interested in how the patient herself perceived her body and therefore it was only the patient who could inform my research correctly regarding her own body. I think similar considerations apply more generally to counselling psychology and psychotherapy, as from the perspective of these disciplines, neuropsychological symptoms may be neurologically mediated but they are occurring in a human person that thus deserves respect and sensitivity when such symptoms are addressed (Fotopoulou, 2008), and hence these fields could actively influence the more general 'social ethos' (Dubnick, 2003) of the multidisciplinary team in neurological wards.

Brain Damage does not occur in a social vacuum

In the current thesis, I mainly focused on the behaviour and experience of individuals with AHP. However, AHP as well as brain damage more broadly, affects both the individual and her social world, frequently changing social roles dramatically, e.g. when one of the two

partners can no longer work, or handle their previous responsibilities towards the family and themselves (Oddy, 1995; McKevitt et al., 2011). As brain damage may affect one person's autonomy and independence, e.g. as in the case of the people in the current thesis who showed various degrees of difficulty in mentally and/or physically taking care of their basic bodily and life needs, or moving freely in the environment and getting one with their lives, it also creates new conditions of social dependency, in turn affecting the psychological and practical lives of others. Similarly, the social world of the patient may experience shock, sadness, anger, fear, guilt and many other strong emotions and psychological conditions (anxiety, fear of illness, fear of death of the other or the self), without the 'benefit' of the 'objectively' recognisable illness. Thus, it is important for counselling psychology to address any arising issues in the social world of its clients, both to their benefit of clients themselves but also to the benefit of their social environment. This task is particularly difficult as brain illnesses can rob people of features that signify their uniqueness and distinctiveness as individuals (Ellis-Hill & Horn, 2000) in at least two ways: a. people may lose some of their pre-damage personality characteristics, personal memories, personal preferences and habits; b. individuals may develop behaviours that make them lose their distinctiveness, such as tics, or 'slow-paced' dysarthric speech, abnormal, environmentally dependent movements and even specific delusions, e.g. my wife is replaced by an impostor, or my arm belongs to my husband (e.g. see Chapter 5) that make the particular individual seem more similar to other individuals with the same symptoms and less similar to the person their families and wider social environment recognise and remember.

The anosognosic symptoms of the participants reported here, for example, did not just affect the 'reality' of their embodiment, i.e. the paralysis, but they also affected their 'shared reality' with relatives and friends. What does a husband think when his wife suddenly insists that her paralysed arm is his own? (see Chapter 4). Conversely, how does a daughter feel about her mother 'choosing to attribute' her own arm to her granddaughter? Thus, for relatives and carers the stroke or other brain pathology also has a subjective, first person significance, despite the fact that their own embodiment is not affected per se. Moreover, such first person perspective may contrast or be in conflict with the experience of the patient, as the case of anosognosia exemplifies. Importantly, as the last empirical chapter of this thesis demonstrated relatives may be an important sources of 'second-' and 'third-'person perspectives on one's condition but 'balancing' of such perspectives with all the 'first-person' experiences involved

and the particular ways and timing of communication of such perspectives to the patient needs some careful consideration and may lead to various ethical dilemmas. Counselling psychologists may have a particular role here, particularly if the finding of the single case in this thesis are extended and validated by additional studies. Specifically, one could imagine that relatives of an anosognosic patient may feel that they are asked to bear with a disability, that the patient herself is not willing to acknowledge. Thus, counselling psychology or psychotherapy may have the specific role of validating the perspectives of both patient and her social environment, while at the same time working with them to progressively try to increase empathy and understanding for the perspective of the other.

In summary, research and psychotherapy in acquired brain injury and particularly in clients with anosognosia raises several of the standard ethical issues of research and practice in counselling and psychotherapeutic psychology but also includes some unique ethical dilemmas that require specialised knowledge, conscious and informed deliberation and courage by the researcher and the clinician. I suppose they should also be accompanied by the knowledge that ethical risk, responsibility and dilemmas are an integral part of one's decision to be a science-practitioner in the field.

6.3. Wider Implications for Existential Counselling Psychology and Psychotherapy

As mentioned throughout the thesis, the consideration of AHP from this interdisciplinary perspective may be of relevance to the practice of existential counselling psychology with anosognosic patients, while also raising a number of considerations as regards some the phenomenological and existential characteristics and challenges of research and psychotherapy in neurological settings. In addition, the findings of the thesis have implications for the practice of existential counselling psychology with other clients that lack insight into somatic symptoms due to an identifiable neurological disease (e.g. traumatic brain injury or dementia; Kotler-Cope & Camp, 1995; Ott, Noto & Fogel, 1996) or in different psychopathological contexts (e.g. functional disorders, obsessive compulsive disorder, or eating disorders; e.g.Vandereycken, 2006a; 2006b). More generally, some of the findings and theoretical considerations of the present thesis may be of relevance to psychotherapeutic work with all clients, in the sense that there are noted self-awareness paradoxes frequently encountered in psychotherapeutic practice and particularly the tension between our conscious wish to change

our psychological tendencies or habits and our simultaneous adherence to our habitual ways of being-in-the-world. I discuss these implications below, with particular reference to three issues: 1) Our embodiment has both physical and psychological aspects and hence damage to the brain and the body requires consideration by psychotherapists and other mental health professional as much as it requires consideration by doctors or, physiotherapists. 2) Our self-awareness is not a unitary ability; it seems to involve several different levels and therapists need to stay open and receptive to both the conscious experience of their anosognosic clients and their habitual, lived experience. 3) These psychotherapeutic insights into this extreme form of motor unawareness may have implications for other, less extreme types of unawareness and their role in therapy, including body image and self-esteem distortions in clients with eating disorders or even no particular neuro- or psycho-pathology.

Psychotherapy After Stroke: As aforementioned, acute anosognosia following a stroke poses a number of clinical challenges and it is viewed as a negative prognostic sign for long-term functional recovery. Nevertheless, there is currently no specialised provision for its psychological treatment or management in most Western countries (Jenkinson & Fotopoulou, 2010). Indeed, the traditional scope of counselling psychology and psychotherapy (and related fields) does not involve treating patients with anosognosia at the acute stage following stroke. Instead, in acute stroke management, anosognosia is mostly regarded as neuropsychological deficit that needs to be diagnosed and 'trained'. For example, patients may be repeatedly reminded of their 'correct' circumstances, their disabilities and 'realistic' prospects in 'instructive' ways under an approach called 'reality orientation' (Holden & Woods, 1995). Although this approach has long been criticized for its rigidity and insensitivity towards the patients' emotions (see Spector et al., 2001 for a recent discussion), no alternative, psychotherapeutic approaches have been put forward for anosognosia following stroke, particularly at the acute stage. Nevertheless, the few attempts to provide psychotherapy to these patients have shown that these symptoms are not only linked with very powerful emotions, but also the apparent emotional indifference in these patients is only superficial and the establishment of a good therapeutic rapport reveals a wealth of psychological attempts to cope with and make sense of the consequences of brain damage (Kaplan-Solms and Solms, 2000). I would like to believe that the present interdisciplinary inquiry into the embodied experience of these patients provides further, albeit indirect, support for the need of psychotherapeutic provision in these patients. Particularly, the video replay case study revealed that even a simple psychophysical intervention, coupled with a psychotherapeutic attitude

could have profound effects on participants. Even more so, the change in awareness I reported in this case study was accompanied mainly by emotional changes and not by any cognitive, sensorimotor alternations. This suggests that psychotherapy could have a central role in helping patients with AHP to come to appreciate their deficits based on their available emotional, copying strategies and the exploration of individual meanings.

The Lived Experience of a Damaged Body in Therapy. In the above context, the existential-phenomenological readings of the empirical findings I presented in the thesis offer a specific perspective to the understanding and psychotherapeutic treatment of patients with stroke-induced anosognosia for hemiplegia. This condition is regarded as unintentional and as unrelated to personal goals and motivations. However, having shown here that these patients may simultaneously have implicit knowledge into their deficit, and even more so that this tacit knowledge is paradoxically intertwined with their conscious inability to perceive their deficits, could potentially offer psychotherapists and counselling psychologists, and more generally all clinicians, a different view of patients with AHP. As Merleau-Ponty suggested clinicians could strive to listen to their clients in a manner that transcends the strict categories of consciousness, such as the 'presence' and the 'absence' of a deficit. Despite their counterintuitive nature, clinicians need to be mindful of such paradoxes in the perception of one's own body following stroke. Stroke patients with anosognosia, particularly when encountered in a psychotherapeutic context as clients, call upon us to bracket and horizontalise the very notion of the physical reality of the body. As aforementioned, a therapist can attempt to relate to patients' lived experience, including exploring their feelings about the body in the context of their lives, without the need to establish a commonly perceived 'reality', or 'world' in such 'objective' terms. A therapist informed by existential-phenomenological insights about patient's implicit knowledge as outlined above, may try to engage with the patient's own subjective experience about the meaning of the habitual body, exploring, describing and even validating their feelings and thoughts in the subjective and intersubjective context that they occur, while also progressively opening them up to further perspectives.

As I discussed in chapter 3, Merleau-Ponty's use of Husserl's concept of the 'horizon' (1945/1962) may be useful in this respect. Our conscious reflections on the world, in this case including the conscious appreciation of our own body and its capabilities, are not but mere abstract derivatives of a lived, embodied experience of the world that lacks the determinate, specific and fixed in their boundaries, hierarchies and categories of our conscious perception. The horizon of our lived, embodied experience includes a rich and dynamic repertoire of

meanings that may not fit the categories of our conscious, 'neatly organised' reflections. In the case of the anosognosic, the perception and description of the physical body as able, familiar and present is therefore simultaneously the understanding of the body as disabled, estranged and lost. The body the patient speaks of is, and simultaneously is not, the body that lies paralysed in front of the therapist. The client, as any client, calls upon the lived body when interacting with the therapist, even at the very moments that he tries to describe his (anosognosic) appreciation of the physical body. It may seem easy and even comforting for the therapist to cling to the observable 'reality' of the paralysed limbs and try to engage the client in such reflections. However, as this thesis has attempted to highlight, such efforts would always leave behind the potentially uncomfortable, prereflective experience of the lived body as habitually active and currently paralysed and lost. For instance, anosognosic patients make comments that appear as random errors to the cognitive, 'reality orientation' therapist, such as 'come back and see me when I will be really ill'. They are seen as mere mistakes regarding 'reality'. For the existential counselling psychologist however, this apparent disregard of reality is equally important as the consideration of the fact that there will be a time when a client will be 'really' ill and in need of help. Thus, such a therapist, may enquire about what this time would be like for the client. They may explore with the patient what such statement may mean in the context of their lives, their relations, their self-regard, thus hopefully in time opening up the patient to further, potentially already experienced ways of being in the world (albeit in different contexts) that entail both ability and disability (e.g. the experience of being a child, a novice in something, of getting lost, of being ill, etc.).

In this regard existential counselling psychology may create a safe space in which reality does not need to be negotiated as such, it can be 'played with' and explored intersubjectively. Consideration of the complex notions of intersubjectivity, social interaction and second-person perspectives in phenomenology and neuroscience (e.g. see Gallagher & Hutto, 2008), as well as psychotherapy (Finlay & Evans, 2009) far exceed the scope of this thesis. Nevertheless, it should be noted that such second-person, relational considerations may be proven to be key in anosognosia where as shown in this thesis the first-person experience of the body is directly affected by brain damage and third-person perspectives may not be habitually available to the patient (e.g. as provided by video-replay in this thesis) and may be rather harsh and emotionally upsetting (e.g. as indicated by the sudden influx of depressive feeling sin our patient). Instead, one could hypothesize that the role of the psychotherapist and counselling psychologist is to facilitate the disrupted transition from a subjective appreciation of one's body (e.g. I am not

ill) to a more 'objective' one (I have had a stroke, I am paralysed) by allowing for a safe intersubjective perspective where the body of the client can be considered from a shared and 'horizontialised' standpoint that may facilitate the integration of the other two perspectives. More generally, one hopes that intersubjective explorations and sharing of several prereflective experiences and their associated meanings during psychotherapy may facilitate clients to arrive at a new subjective understanding of the body and a consideration of its role in their own, dynamic and wider 'world-horizon'.

Unawareness in other Psychopathologies and Everyday Life. I believe the results of the present experiment further highlight the challenges faced by the existential counselling psychologist, or psychotherapist in their potential attempts to respond to the needs of anosognosic patients, as well as to any client who presents with issues regarding the human paradox of self-awareness. Specifically, the present findings highlight how an existential therapist needs to be attuned not only to the conscious content, agency and wishes of their clients but also to their more general, embodied commitment to the world and their 'embodied intentionality'. For instance, one could speculate that despite their conscious unawareness of their thin body, individuals suffering from anorexia nervosa or related eating disorders, or even individuals with everyday 'body dissatisfaction' concerns may be simultaneously and tacitly aware of the threat to their bodies by eating restriction or by excessive exercise and similar practices. Moreover, if the conclusions of the present study are found to be of some validity, this tacit knowledge of one's emaciated or, threatened body may be paradoxically intertwined with an individual's conscious inability to appreciate their difficulties. The more available foods and temptations call upon the hunger instincts of the anorexic body for instance, the more their conscious need to control such hunger may be. Such insights on the treatment of anosognosia and other somatic disorders are of course speculative, as they have been generated by third-person, philosophical reflection and confirmed by third-person, scientific experimentation. Thus, they cannot be taken for granted in every client, and need to be considered as a possibility rather than a certainty in each case. Nevertheless, they may be a useful reminder of the paradoxical nature of our embodied and reflective self-awareness and they could potentially lead to further theoretical and empirical considerations in this respect. In brief, I believe that the results and reflections of the present thesis on anosognosia for hemiplegia capture and bring to light dramatically the more general paradox underlying certain clients' motivation for therapy. On the one hand they come to therapy consciously hoping to

change their habitual ways of being-in-the-world while on the other hand they may hope not to change their commitment to the world.

In conclusion, research and psychotherapy in acquired brain injury and particularly in clients with anosognosia raises several epistemological and ethical challenges, particularly as regards the paradoxical relation between our lived body and our reflective appreciation of our embodiment. Inspired by the existential-phenomenological writings of Merleau-Ponty on anosognosia, I have endeavoured to conduct clinically-relevant, interdisciplinary research in a way that does justice to both the neural and psychological aspects of anosognosia. I have thus discovered in practice that epistemological challenges, risks and dilemmas are an integral part of my decision to be a science-practitioner in this field. I do however believe that these risks have generated some valuable results and insights, with three particular implications for the field of counselling and psychotherapeutic psychology, namely 1) Our embodiment has both physical and psychological aspects and hence damage to the brain and the body requires consideration by psychotherapists and other mental health professional as much as it requires consideration by doctors or physiotherapists. 2) Our self-awareness is not a unitary ability and therapists need to stay open and receptive to both the conscious experience of their anosognosic clients and their habitual, lived experience. 3) Future research could explore whether these insights into this extreme form of motor unawareness may also apply to other, less extreme types of unawareness and their role in therapy.

7. References

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8. Appendices

8.1. Appendix I: Verbal Anosognosia Assessments

Awareness Test

Marcel/Berti Extension:

Name: _____

Age:_____

Date:_____

Date of Birth:_____

Handedness:_____

Comments:_____

Education:_____

Profession:_____

Main/Replication_____

Rater:_____

BERTI ET AL. 1996: OPEN QUESTIONS: Upper limb

1. - Where are you?

- Why are you in hospital?

- How is your left arm?

- Can you move it?

(if NO) Why can you not move your left arm?

---

2. If the patient verbally denies left upper limb motor impairment, then ask:
   - Please touch my hand with your left hand (the examiner puts his/her hand in the patient's right visual field)

- Have you done it?

(If the patient answers NO) Why have you not done it?

(if the patient answers YES, then) Are you sure? It is strange as I have not seen your hand touching my hand.

Score---------

NORMAL (0) MILD ANOSOGNOSIA (1) SEVERE ANOSOGNOSIA (2)

0 = the patient answered correctly to the first group of questions.

1 = The patient acknowledged being in the hospital and/or being affected by a stroke but denied his or her upper limp impairment. However the patient acknowledged that the left arm did not reach the examiner's hand.

2 = The patient claimed thathe or she had reached the experimenters hand.

BERTI ET AL. 1996: OPEN QUESTION
lower limb

1. How is your left leg? Can you move it?

---

2. Can you walk without any problem?

Score --------

NORMAL (0) MILD ANOSOGNOSIA (1) SEVERE ANOSOGNOSIA (2)

SCORE

0 = The patient either spontaneously reported the motor impairment of the lower limb when first asked about the reasons for his or her being in the hospital (see above) or acknowledged paralysis when specifically questioned about the left (right)leg.

1 = The patient answered 'well' to the first question but acknowledged the impossibility of walking.

2 = The patient claimed that he was able to walk.

Anosognosia for Hemiplegia Questionnaire

Feinberg, Roane and Ali (2000)

Do you have weakness anywhere?	
Is your arm causing you any problems?	
Does it feel normal?	
Can you use it as well as you used to?	
Are you fearful about losing your ability to use your arm?	
Is the sensation in your arm normal?	
The doctors tell me that there is some paralysis of your arm. Do you agree?	

(Left arm is lifted and dropped in left hemispace.) It seems there is some weakness. Do you agree?	
(Left arm is lifted and dropped in right hemispace.) It seems there is some weakness. Do you agree?	
Take your right arm, and use it to lift your left arm. Is there any weakness of your left arm?	
Total	**/10**

Score 0 if the patient showed awareness of deficit; 0.5 for partial awareness; and 1.0 for complete unawareness or denial.

Feinberg Assessment of Verbal Asomatognosia

Feinberg, Haber, and Leeds (1990)

(Lift the normal right arm) What is this? *Required to answer correctly to be included in the study*	
(Lift the left arm by the elbow and move the patient's hand and forearm into the right hemispace) What is this? *Judged to have verbal asomatognosia if the limb is misidentified.*	

Care should be taken to keep the examiner's hand and arm out of the patient's right hemispace.

8.2. Appendices II and III: Information Sheet and Consent Form

Patient Information Sheet

Version 3: 12.02.07

TITLE OF PROJECT: **Awareness of Illness Following Brain Damage**

• You are invited to participate in a psychological study conducted at St. Thomas's Hospital. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. If you are currently unsure, you can think it over and let us know if you decide to take part any time in the following three weeks.

Consumers for Ethics of research publish a leaflet entitled 'Medical Research and You'. This gives more information about medical research and looks at some questions that you may want to ask. Please ask for a copy or it may be obtained from CERES, PO Box 1365, London N16 0BW

Thank you for reading this.

1. What is the purpose of the study?

The overall purpose of this 2-year long study investigation is to explore and evaluate the subjective experience of illness following brain damage. Being aware of what has happened to you and how it may affect your future life is sometimes seen as a simple mental task. In reality, it is very complex cognitive process (a mental ability) and one that has not been sufficiently explored by scientists. Crucially, some patients may partly or wholly lose such ability, if certain areas of their brain are affected. This study aims to investigate the neurological and psychological basis of such processes. More specifically, the purpose of the study is to understand how emotions and thoughts about oneself may affect one's perception of motor and visual difficulties and their everyday consequences.

2. Why have I been chosen?

In total, around 30 individuals will participate in this study. You, as well as the other participants, were chosen based on the type of brain damage you had and particularly the site of the problem.

3. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. *If you decide to take part you are still free to withdraw at any time and without giving a reason.* A decision to withdraw at any time, or a decision not to take part, *will not affect the standard of care you receive*.

According to your notes you have not participated in any other research, but please note that if you have been involved in any other research project, you should not take part in this study.

4. What will happen to me if I take part?

You are asked to take part in this study by participating in different psychological studies and tasks. These will take place in four to six different sessions, which will last a maximum of an hour each and will be scheduled, at your convenience, on non-consecutive days. During the first session you will be encouraged to describe the experience of your neurological illness and give its history. A number of standard cognitive tests of memory, attention and problem-solving will also be administered in the first and second sessions. For example, you will be asked to complete a number of tests concerning knowledge (e.g. defining words),

thinking (e.g. interpreting proverbs) and attention (e.g. identifying common patterns in figures). During these tasks we will also measure certain physiological functions, such as your heart-rate. In the third session, you will be asked to answer a number of questions regarding your present emotions and the view you have of yourself following your illness. In the next two sessions, you will be asked to perform certain cognitive tasks such as completing sentences, and memorising words or phrases. You need to be concentrated in order to complete these tasks. At the last session, we will explain the details of certain of the administered tests in ways that we will not be able to reveal until you have completed the tasks. If you wish you may also ask for feedback on your answers, although the full results of the study will not be available at that stage. Your answers may be audio- and video- recorded and we may look at these recordings together if you wish. If out-patient appointments are arranged (subject to your agreement and convenience) we will reimburse your travel expenses to and from the hospital.

Please note that these sessions are independent of your clinical care and treatment, and they should not interfere with the latter at any stage and for any reason. Please also note that they are not needed for your care.

5. What are the possible disadvantages and risks of taking part?

There are no anticipated risks involved in this research, but if you should experience mental and/or physical fatigue, or any form of psychological distress please be aware that you could inform the investigator immediately and discontinue the session or even the study, if you wish and without consequences.

6. What are the possible benefits of taking part?

There is no direct benefit to yourself from taking part in the study. The information we get from this study may help us to understand and treat future patients with similar brain damage better.

7. Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential. Any information about you which leaves the hospital will have your name and address removed so that you cannot be recognised from it. All audio- and video- recordings made will be suitably anonymised, securely stored and made accessible only to the investigators. Anonymous data will be extracted from these recordings and the tapes will be destroyed 3 years after the completion of the study. Anonymous data will be retained for 5 years following their potential publication.

8. What will happen to the results of the research study?

The results of the research will form the basis of future scientific papers. These will be submitted for publication approximately one year following the completion of the study. Your identity and the confidentiality of your answers will be protected.

9. What if something goes wrong?

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have grounds for a legal action but you may have to pay for it. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been approached or treated during the course of this study, the normal National Health Service complaints mechanisms should be available to you.

10. Who is organising and funding the research?

This study is a research project, forming part of a two-year research fellowship at King's College, University of London and a doctorate degree at Middlesex University. The study is being funded by a joint grant of the Medical Research Council, and the Economic and Social Research Council.

11. Who has reviewed the study?

The study has being reviewed by the Ethics Committee of the South London & Maudsley NHS Trust/Institute of Psychiatry.

CONSENT FORM

TITLE OF PROJECT: **Awareness of Illness Following Brain Damage**

Please tick as necessary

Have you read the Subject Information Sheet? YES

Have you had an opportunity to ask questions and discuss the study? YES

Who have you spoken to? Dr/Prof. .....

Do you understand that you are free to withdraw from the study:

* at any time
* without having to give a reason for withdrawing
* and without affecting your future care and treatment? YES

Do you understand that some of your answers in the study will be audio- and video-taped ? Do you consent to the unattributed and confidential use of these recordings for scientific purposes? YES

Do you understand that sections of any of your medical notes may be looked at by the main researchers where it is relevant to your taking part in research? Do you give permission for these individuals to have access to your records? YES

Participant
Signed .....……..... **Date** .....

(NAME IN BLOCK LETTERS) .....…….....

Researcher
Signed .....……..... **Date** .....

(NAME IN BLOCK LETTERS) .....…….....

NB Three copies should be made, for(1) participant, (2) researcher, (3) hospital notes

8.3. Appendix IV: Hayling Test Sentences

Sentences are presented here in thematic order (rather than randomised), in order to highlight their linguistic and syntantic similarities across the three (colour coded here) semantic categories, i.e. disability, neutral and negative. Their syntax and grammar and word and letter count is matched as closely as possible:

1. Being unable to move your limbs when you want to, can make you feel very _____
2. Being unable to park your car where you want to, can make you feel very_____
3. Being unable to defend yourself when physically attacked, can make you feel very_____
4. Being depended on others is something that you may have to get use to following your brain _____
5. Wearing a seat-belt is something that you may have to get used to when driving your new_____
6. Being in danger is something that you may have to get used to when walking in dodgy_____
7. Because you can no longer move on your own you might feel less able than _____
8. Because you cannot drive an automatic car you might feel less modern than _____
9. Because you can rarely go out alone at night in safety you might feel more constrained than_____
10. Following severe brain damage your movement may be _____
11. Following a severe motor accident your car may be _____
12. Following a severe sexual assault your confidence may be _____
13. When you are paralysed, you cannot even get dressed on your own and you have to ask for_____
14. When you are a new driver you cannot even get into the garage on your own and you have to park_____
15. When you are physically assaulted you sometimes cannot even get over it on your own and you have to ask for_____
16. A hoist is often used to lift paralysed patients off the_____
17. A tow truck is often used to pull broken-down cars off the_____
18. An ambulance is often used to take assaulted people to the _____
19. Wheelchairs are used for people who cannot _____
20. Glasses are used for drivers who cannot _____
21. Tranquilisers are often used for violence victims who cannot_____
22. Often people who had a stroke need physiotherapy in order to re-learn how to move their _____
23. Often drivers who previously lived abroad need driving lessons in order to learn to drive on the opposite _____
24. Often people who have been physically assaulted need psychotherapy in order to feel more _____
25. Some people recover completely following brain damage but others might be left with some permanent motor _____
26. Some cars can be repaired following motor accidents but others might be left with some permanent mechanical_____
27. Some people recover completely following physical attacks but others might be left with some permanent emotional_____
28. Trying to drive your car when its engine is damaged can be very _____
29. Trying to move your body when your brain is damaged can be very _____
30. Trying to escape when you are physically attacked can be very_____

8.4. Appendix V. Experimental Design and Set-Up in Chapters 4 and 5

Chapter 4. Design

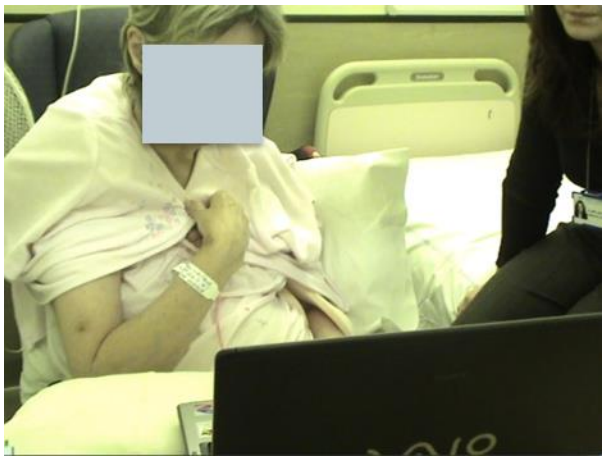
Instruction to Patients	Rubber Hand Held by Experimenter	
	Movement	No Movement
Self-Intention	Control for Vision, Attention and Comprehension	Condition Similar to Clinical Presentation
Other-Intention	Control for Vision, Attention and Comprehension	Critical Control Condition for the Motor Intention Hypothesis
No Intention	Control for Vision, Attention and Comprehension	Critical Control Condition for the Motor Intention Hypothesis

Chapter 4. Set-up

Chapter 5. Design

Pre-Assement	Video Viewing	Post-Assessment
Neurolological, Neuropsychological and Awareness Battery	90 seconds	Neurolological, Neuropsychological and Awareness Battery

Chapter 5. Set-Up.



8.5. Appendix VI. Glossary

Body Agency. A fundamental facet of the bodily self referring to the sense, feeling or metacognitive judgement that I am the cause or author of a movement and its consequences in the world) (Gallagher, 2003; Legrand, 2006).

Body Ownership. A fundamental facet of the bodily self referring to the sense, feeling or metacognitive judgement that I am the subject of a voluntary or involuntary movement, or that I am experiencing a certain sensation like touch.

Core or Minimal Self. The common denominator of all other facets of self-consciousness, or awareness, experienced by the subject as an immediate subject of experience, unextended in time (Gallagher, 2000). Importantly, this minimal self is not to be conceived as a kind of internal representation of some substance called the "self". Instead, minimal selfhood is conceived as an ongoing, dynamic and emergent processes of tracking and controlling bodily properties as a whole and hence the notion of the self needs to be grounded in its *bodily foundations* (Bermúdez et al. 1995; Gallagher 2005; Legrand 2006). The idea that our everyday experiences are characterized by a minimal or 'pre-reflective' (see term) sense of self has been highlighted by a longstanding phenomenological tradition and more recently referred to as the "minimal self" by contemporary philosophers such as Zahavi (2005, 2014), Gallagher (2008) and Legrand (2006) with direct reference to the phenomenological tradition. According to such views, the development of the mind, and particularly cognition, can be viewed as the consequence of embodiment within a wider physical and social environment.

Embodiment refers to the fact that the experiences I am living through are given to me through my body, an organism situated in a particular space-time context.

First- and third-person perspective. The first-person perspective can be considered as a basic constituent of a ''minimal self'' (Gallagher, 2000). It enables us to experience the subjective multimodal experiential space centered on our own body (Vogeley et al., 2004). At a phenomenal level, the first-person means the centralization of the subjective multidimensional and multimodal experiential space around one's own body. At a representational level, it coincides with the egocentric reference frame, constituted by subject-to-object relations which can be distinguished from the allocentric reference frame constituted by object-to-object relations. At the phenomenal level, it can be opposed to the third-person perspective, in which mental states are ascribed to someone else. In visuospatial perspective taking, one can take a visuospatial third-person perspective but remain egocentric, i.e. translocate the first-person perspective into another space.

Motor awareness. A fundamental facet of the bodily self, referring to the sense, feeling or metacognitive judgement that I am moving, or have just executed a movement.

Narrative, or extended self. A more or less coherent self (a self-story or self-image) that is constituted with a past and a future in the various stories that we and others tell about ourselves (Gallagher, 2000).

Non-conceptual, or non-representational first-person content. The content of a primitive self-consciousness that is not informed by conceptual thought, or reflection. For example, the ecological content of perception that specifies one's own embodied position in the environment (Gallagher, 2000).

Perception is used to describe a 'cognitive process' of appreciating certain properties of stimuli in the environment or changes in one's own body.

Reductionism. Methodological reductionism refers to the splitting of a larger question or phenomenon to smaller parts or processes with the aim of reducing its complexity and increasing the possibility of studying such components with greater precision and scientific control. **Epistemological** reductionism refers to the theory that a larger, or complex phenomenon can be explained by certain more fundamental processes at a lower level of analysis. **Ontological** reductionism as applied to mental phenomena refers to the theory that all mental phenomena can be reduced to physical causes.

Tacit or implicit awareness is defined as "knowledge that is expressed in task performance unintentionally and with little or no phenomenal awareness" (Schacter, 1990, p. 157).

Unawareness of deficit. The apparent loss of one's ability to sense, feel or judge a physical, emotional or cognitive disability, or its consequences.